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AIR FORCE

THE MAGAZINE OF AMERICAN AIRPOWER

June 1956 • 35c

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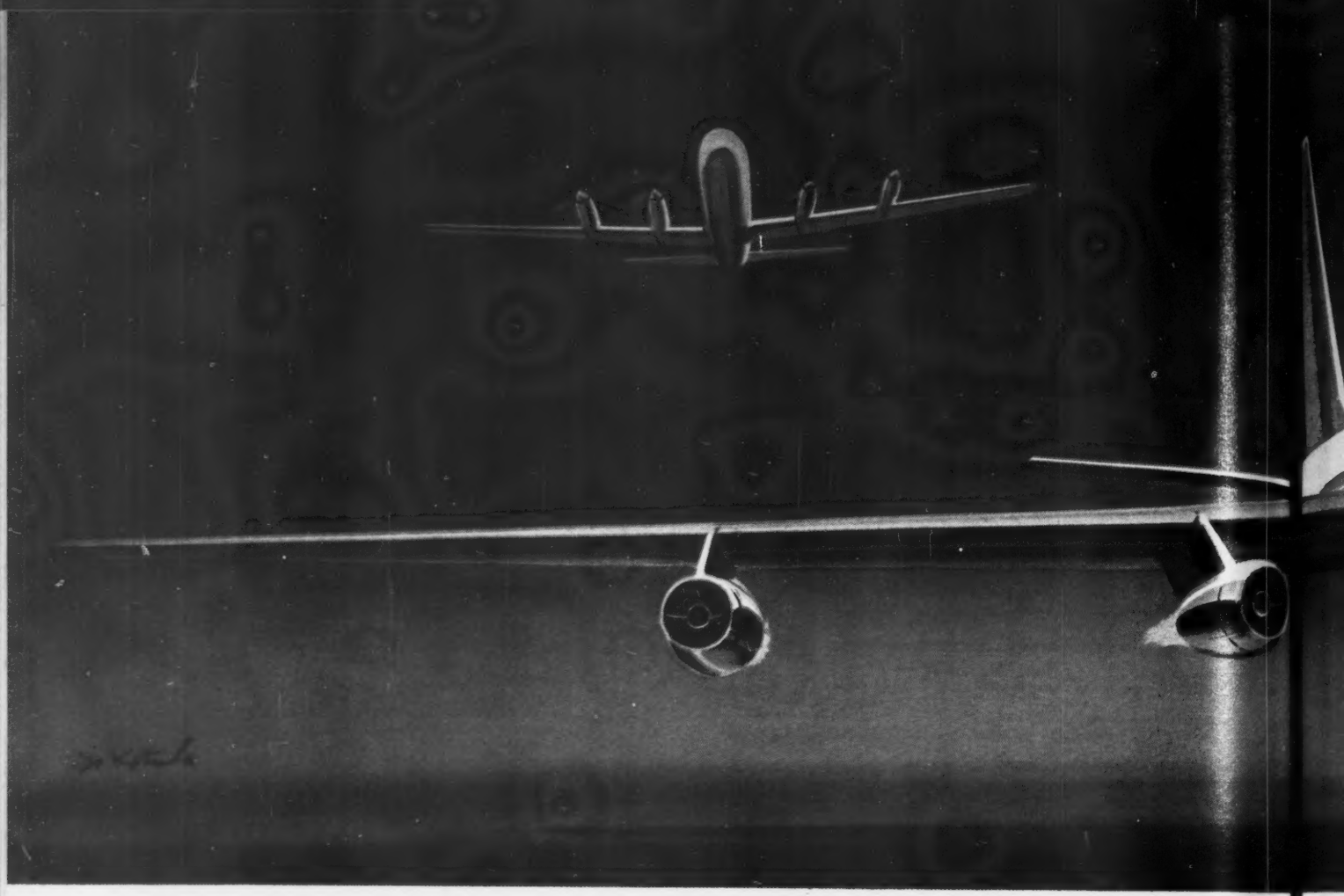
Mission: 'Defend the US Against Air Attack'

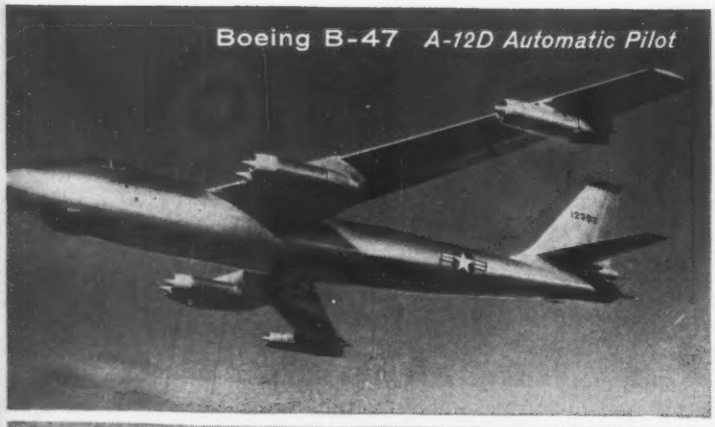
AIR DEFENSE COMMAND

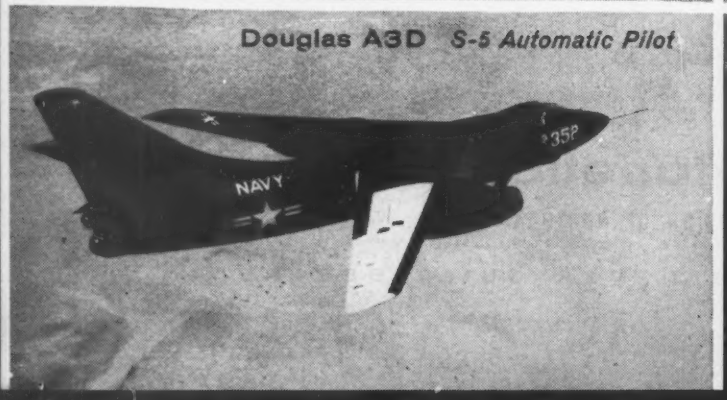
ALSO IN THIS ISSUE:

The Navigator's Back Again



ANNOUNCING NEW SPERRY F





Y FLIGHT CONTROL SYSTEM

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SPERRY GYROSCOPE COMPANY
Great Neck, New York

DIVISION OF SPERRY RAND CORPORATION

air mail

More from the Author

Gentlemen: My article on civil defense in Great Britain, which appeared in your April issue, was written originally before the government's 1956 Statement on Defense appeared. I should like to take this opportunity of confirming one or two items which had to appear as forecasts in my article, and to correct a few details in the light of this latest Statement.

In the first place, the government, as I suggested, has quite clearly decided to pin its faith on evacuation rather than on a shelter policy for the civilian population. Evacuation will be first undertaken for priority classes —mothers, young children, and the aged—and the country is to be reclassified into evacuation, neutral, and reception areas. Quite clearly, whatever shelter work is undertaken will be designed to adapt existing buildings by a minimum of expenditure. The government has further announced that it regards the "establishment of effective systems for monitoring radioactive fall-out and providing public warning as one of the first requirements in home defense."

There have been some small alterations in the totals of men from the armed forces who are to be specially trained for civil defense work. The number of men specially trained in fire-fighting duties to provide a supplement for the national fire services is to be stepped up from 10,000 to 12,500 a year, the extra number to be provided by the Army. On the other hand, the number of men to be trained for the Mobile Defense Corps is to be reduced from forty-eight to thirty-six battalions of 600 men each. This total is to be provided by an annual intake of 7,500 men from the Army and it is reckoned that the strength of units will be up to a maximum by about the end of 1959.

These changes in totals seem to me to call for only one comment. If we face up to the horrifying possibilities of hydrogen bombing then these numbers, even for so small a country as Great Britain, clearly won't be enough. Nor are even these numbers likely to be easy to find if and when the three Services become fully professional, as the government clearly hopes. It is difficult to avoid the impression that the problems of nuclear war are being less honestly faced up to in civil defense than in the business of active fighting.

Norman H. Gibbs
Oxford, England

Another Refueling Method

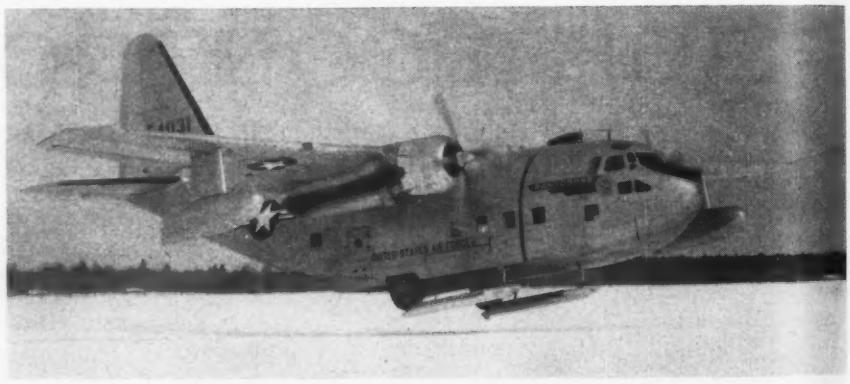
Gentlemen: Your "Clancy Lowers the Boom" article appearing in the April issue of AIR FORCE certainly was well written, timely, and thorough. However, I strongly feel the author, Col. E. D. Reynolds, could have brought out the fact that while the flying boom is serving his purposes, the probe and drogue method of aerial refueling is used exclusively by the US Navy and Tactical Air Command.

The probe and drogue system was developed by Flight Refueling, Inc., Baltimore, Md. Fundamentally the system has these advantages: Multiple refueling; lightweight; small size; flexibility; handling ease; completely automatic; air-to-air advantages; light take-offs; fast climb; and tactical flexibility.

An enlightening article regarding the probe and drogue method appeared in a recent issue of *Aeronautical Engineering Review.* Written by Lt. Col. Walter P. Maiersperger, USAF, it dealt with the general design aspects of flight refueling. Lt. Col. Maiersperger wrote:

"The simplicity of this system is readily apparent. Its hose trails at an angle of only ten to fifteen degrees to the relative wind, so that it inherently has a higher design airspeed capability than previous systems of flight refueling. No operator is required, and sequencing of the hose-reel mechanism can be done by one of the regular members of the air crew from a remote position without having visible reference to the refueling operation itself. This also permits multipoint

(Continued on page 7)



In "Tech Talk" in the May '56 issue of AIR FORCE, the text on page 94 and the caption with the above picture on page 97 erroneously identified the Stroukoff YC-123E during Arctic-condition tests at Lake Bemidji, Minn., as a "Stroukoff-Fairchild" airplane. Stroukoff Aircraft Corp. assures us that the plane was designed and built by Mike Stroukoff at the Stroukoff Aircraft factory in West Trenton, N. J., and that it is entirely a Stroukoff product. The YC-123E Pantobase all-surface aircraft has been successfully flown from water, land, and snow in Air Force tests.—The Editors.

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tanker configuration, so that more than one aircraft . . . can be refueled at one time. Functional tests of this equipment and development to increase the design air speed and the rate of flow of this equipment have been continuing since 1950. Further, the probe and drogue system permits flight-refueling operations during far higher levels of turbulence than the flying boom."

Clyde E. Bourke, Jr.
Flight Refueling, Inc.
Baltimore, Md.

It's an RF

Gentlemen: The SAC edition of AIR FORCE Magazine received and it's excellent. It's a technical point, but the version of the F-101A shown on your title page (108) for the SAC fighter section is the RF-101A, photo recon ship, which is destined for TAC rather than SAC. This F-101A is for SAC; and the F-101B is for ADC. The photo on page 115 is also the RF.

Robert H. Wood
McDonnell Aircraft Corporation
St. Louis, Mo.

How They Gonna Get There?

Gentlemen: In his letter advocating the location of the Smithsonian Institution's Air Museum at "the historic College Park Airport," Mr. F. T. McHugh neglected to tell us how the average Smithsonian visitor could be induced to go to historic College Park, or, for that matter, to even more historic Kitty Hawk?

Cy Caldwell
Baltimore, Md.

Somebody Please Explain

Gentlemen: On the same page of AIR FORCE, March '56, were two letters on the problem of "Unification."

One letter from a Professor of Air Science proposed a study for complete unification of all US armed forces, with lower echelons specializing in various functions.

Another letter from the Air Force Armament Center solicited personnel, such as ballisticians, physicists, and engineers, for employment at that Center, having recently "been given the responsibility for the development of aerial munitions, including guns, bombs, rockets, fuzes, guided missile war heads, and related equipment, exclusive of nuclear weapons."

The question naturally arises, "Why is the Air Force setting up its own armament (Ordnance) development agency?" The Defense Department has two such Ordnance development agencies now, (the Army Ordnance Corps and Naval Bureau of Ordnance), both of which have traditionally performed development of "aerial munitions" for the flying services. They both have rich backgrounds of experience and are no doubt well staffed to continue to perform such armament development, utilizing their experience gained in the development of related and similar weapons for their own ground and sea forces.

Is this another example of "unification by triplification"? Will someone please explain it to me?

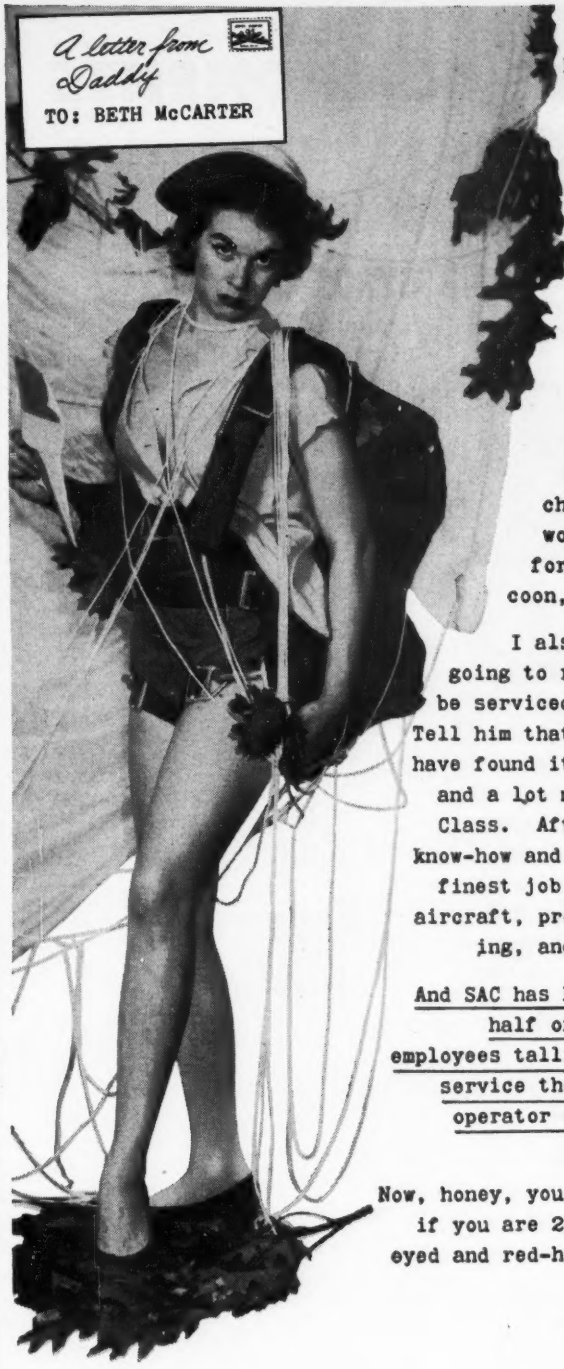
Armament Engineer

More Family Life Needed

Gentlemen: Your article "SAC's Achilles Heel" in the April issue, by John G. Norris, should evoke some comments from former servicemen, and possibly some reenlistments and a few new enlistments. It is unfortunate that the listing of all proposed revisions in the Air Force plan of incentive cannot be a listing of definite provisions for the prospective airman. It does seem a bit ridiculous to have to practically offer men everything except their own private planes to join a team for the protection of the things they cherish the most.

Of course, there will always be

(Continued on following page)



Dear Beth:

No, I don't mind you flying around with that Mergatroid McSquirtle from next door, providing you take certain precautions. Airplanes are safe but I just don't trust McSquirtle. In case he lives up to his reputation as a ladies' man, you better always wear a parachute. Keep this letter in your chemise as a reminder: If worst comes to worst, make for the door like a scalded coon, curtsy coolly, and leap.

I also insist that, if you're going to ride in it, Mergy's plane be serviced by Southwest Airmotive. Tell him that all old business pilots have found it's really less expensive and a lot more sensible to go First Class. After 24 years, SAC has the know-how and equipment to do flying's finest job on engines, accessories, aircraft, props, instruments, refueling, and new-parts distribution.

And SAC has Experience! In the first half of '56 alone, 40 Southwest employees tallied up 300 years of total service there. No other comparable operator can make a statement like that about its workers.

Now, honey, you're NOT experienced, even if you are 21, 124 lbs., 5'6", hazel-eyed and red-haired. So w-a-t-c-h that Mergatroid McSquirtle!

Love, Daddy

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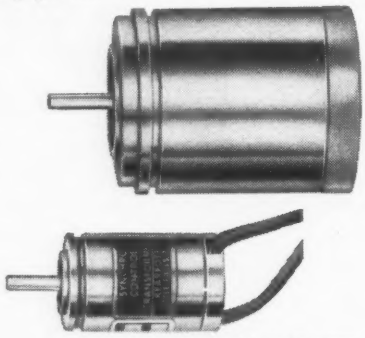

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Kearfott (Penny Size) Servo Motors measure only .750 inches diam. x .980 inches and weigh 1.2 oz. They are ideal for instrument servo applications because of their high torque-to-inertia ratio and small size and light weight.

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AIR MAIL——CONTINUED

men who thoroughly dislike the service, and regimentation of any kind just has no appeal for them, but your listings of the reasons men leave the AF just about sums it up beautifully.

As a former airman first class, I can only say that if the situation had been such as the proposed plans present, or even if they had had the plans formulated with some promise of execution, I would still be with the Air Force. I was stationed in French Morocco (Nouasseur AFB) under SAC and fifteen months there convinced me at the time that there really was nothing to look forward to by staying in. Many of the men in our group were treated with less consideration than most of the Arabs who worked on the base. Such instances included the one of a very young man whose mother died in the States and he was refused leave to see her for the last time. Two weeks later our Commandant of Troops received word that his mother had died and within five hours he was headed for the USA. Why officers and not enlisted men? The older man should have been much more capable of withstanding a shock like that than a young man who had left his mother just a few months previous. Another thing was the problem of civilian personnel with the Air Force. There existed a great number of family housing, but the civilians were always given first choice while the airmen who had families either ended up with broken homes or spent all of their spare time in the Casablanca dens of iniquity only to report to medical with various phases of venereal disease. The civilians could have easily paid rents to the local populace of Casa as their salaries could well afford it. The civilians could have their families join them any time they chose, the airman had to have proof of a prospective rental and rank besides. Even then they were discouraged.

These are but a minor few of the things that I saw as a very good reason for men not staying in the service. Since it is impossible for the Air Force to be comprised of all single men (and expect them to remain single) there should be great emphasis placed on the family life and problems of the men in all branches. Your answer lies in the fact that a wise prospective employer interviews the wife as well as the applicant for almost positive assurance of gaining a good, stable, contented employee. So why should the Air Force be satisfied with a group of half-men while the other half remain far removed?

A. Bourk, Jr.
Pomona, Calif.

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Scinseal is used in such specialized fields as underwater devices, ground radar equipment, missile control wiring.

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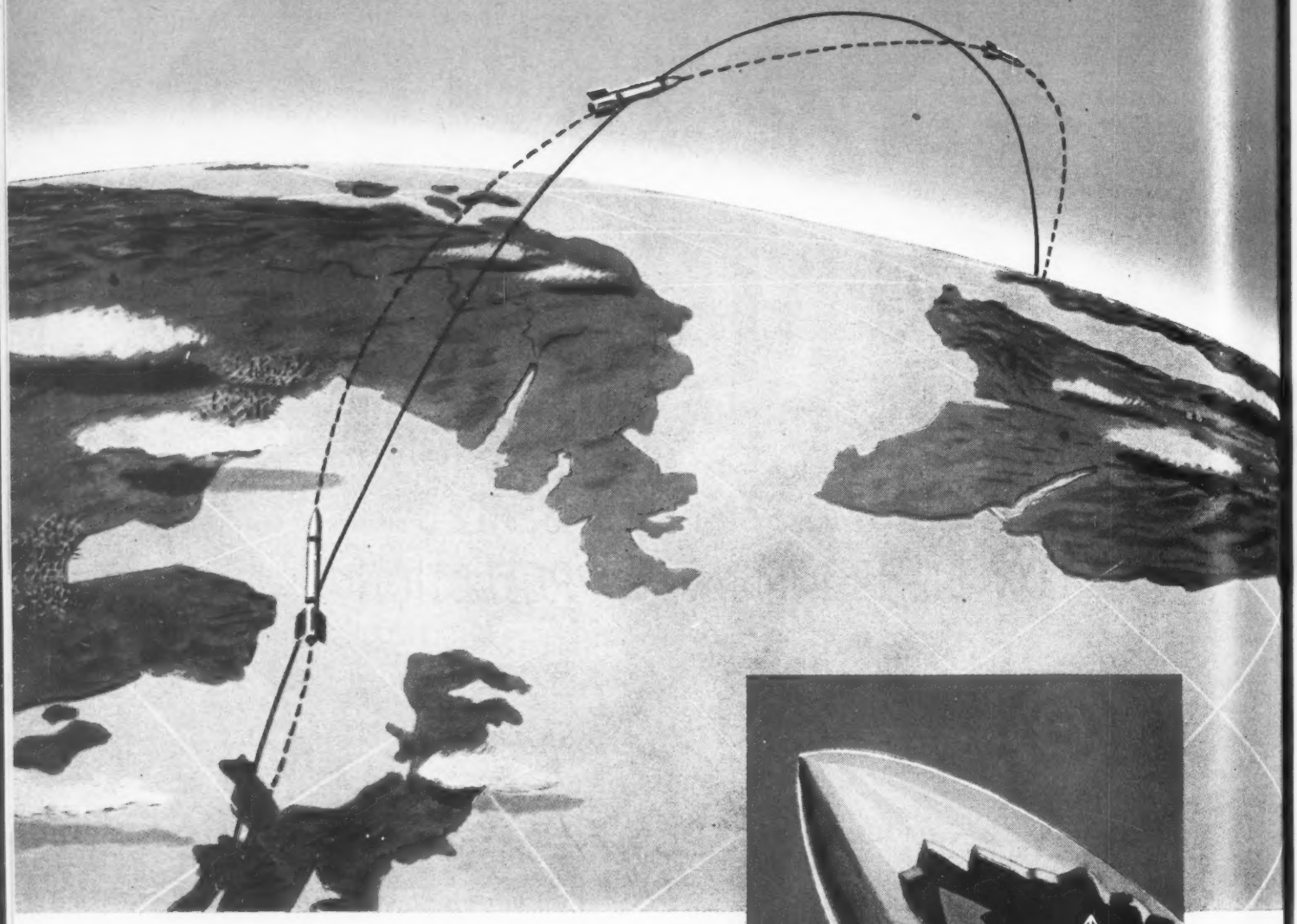

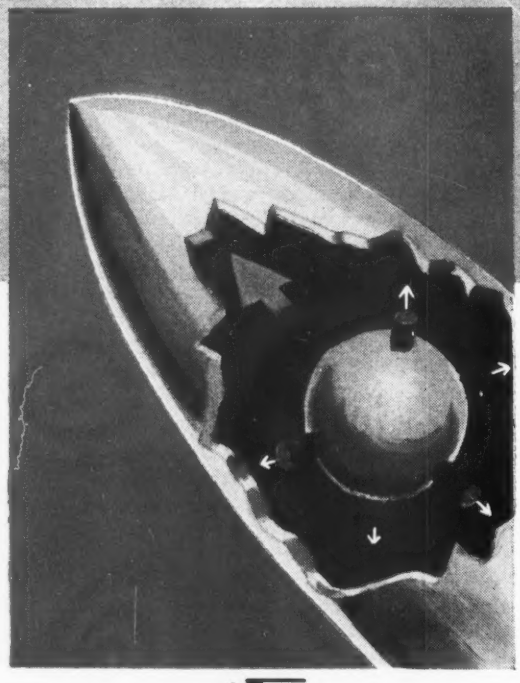

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AIR FORCE
THE MAGAZINE OF AMERICAN AIRPOWER

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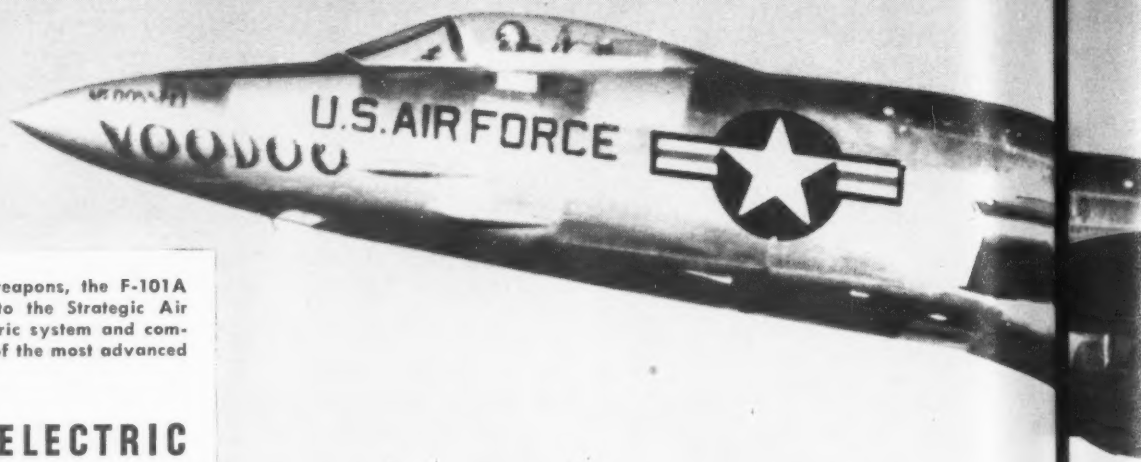
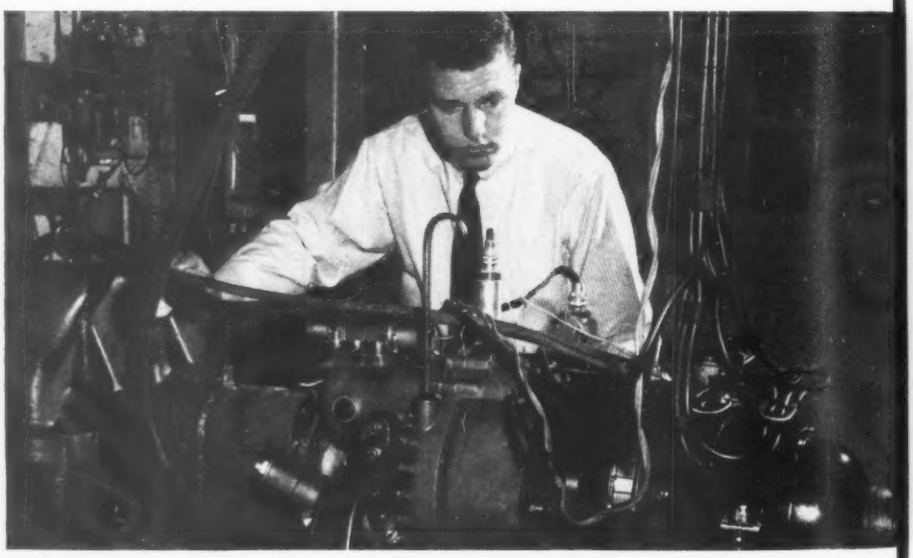


Capable of carrying atomic weapons, the F-101A is scheduled for assignment to the Strategic Air Command. G-E automatic electric system and computing sight help make it one of the most advanced fighters in the air today.

GENERAL ELECTRIC

How G-E Electric System and Gunsight Help

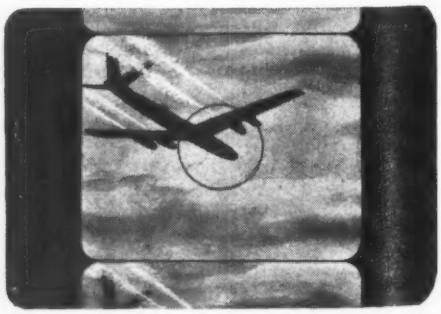
Main components of system include static voltage regulator and control panel.



Alternator receives test. General Electric tested the complete F-101A electric system prior to first airplane installation.

Typical computing sight operation: pilot makes contact and aligns target in sight.

Pilot keeps enemy aircraft aligned in sight and fires when target is within range.



Hit! Camera guns show that enemy would have been destroyed.

Make F-101A a Potent SAC Fighter-bomber

• G-E power generating system eliminates 10 pilot functions in start-up
• G-E computing sight permits more accurate weapons firing

The Air Force's new supersonic jet fighter, the McDonnell F-101A Voodoo, is being equipped with a G-E computing sight and an automatic electric system which requires no pilot attention.

Designed with emphasis on simplifying the job of the pilot through use of automatic equipment, which includes a paralleling control furnished by another manufacturer, the G-E electric system begins operating as soon as the pilot starts the engine.

SPEEDS TAKE-OFF The control has only two toggle switches, which may remain "on" at all times, even when a fault develops. This eliminates a series of 10 pilot functions, and sharply reduces the time to become airborne.

With a generator that can operate at the high ram-air temperatures of supersonic flight, and a static voltage regulator that has no moving parts except the relays, the G-E system is designed for long life and reduced maintenance time. The control panel supplies the automatic control of start-up, shutdown, and maximum selective protection against ground fault, over- and under-excitation, and over- and under-voltage.

LIGHTWEIGHT GUNSIGHT HAS HIGH ACCURACY Giving the F-101A high fire-control accuracy for air-to-air gunnery is the G-E designed computing sight. It features lightweight and low maintenance due to its simple design. Automatic inputs assure the sight's accuracy for all modes of operation.

For more information on the General Electric power generating system, write Section 210-97, General Electric Co., Schenectady 5, N. Y. If you are cleared to receive classified material, see your nearest G-E Apparatus Sales representative for advantages of the computing gunsight. General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

By Wilfred Owen

The scheduled airlines had $1,250,000,000 worth of equipment on order at the end of 1955. According to the Air Transport Association these orders included 135 turboprop airplanes, 131 pure jets, and fifty piston type.

° ° °

US railroad travel last year dropped 2.7 percent from the 1954 level, while commercial airline travel was up nineteen percent. Bus travel was unchanged.

° ° °

The Douglas DC-3 remains the most commonly used airliner in domestic service. One out of every five aircraft in the entire civil airline fleet is a Douglas pre-war model.

° ° °

The Civil Aeronautics Administration uses eighty-five planes equipped with electronic testing devices to check the accuracy of ground aids to air navigation along the nation's 100,000 miles of airways.

° ° °

In the five years 1950 through 1954, a total of 6,000 private aircraft were completely destroyed in accidents.

° ° °

American Airlines in Buffalo can sell or cancel space or obtain en-route information by pressing a button that gets immediate answers from a reservation "brain" 300 miles away in New York City. Two magnetic drums that whirl at 1,200 revolutions per minute memorize the inventory of seats for any ten-day period.

° ° °

As of mid-1955 there were 482 areas in the US designated as "Prohibited," "Restricted," or "Warning Areas" in which normal military or civil aviation cannot be regularly conducted. That means 300,000 square miles of airspace are unusable.

° ° °

Airspace is reserved for military training, artillery firing, ordnance plants, the Atomic Energy Commission, television transmitting towers, and the preservation of wilderness areas.

° ° °

Heliflights Inc., a helicopter service for the Duluth, Minnesota area, starts operations this summer. New York Airways carried 46,500 passengers by helicopter in 1955, operating between airports and to points in nearby Connecticut and New Jersey.

° ° °

Six years of scheduled helicopter service in the United States and Europe have been completed without a single passenger fatality. According to the Civil Aeronautics Board, there has never been a fatal accident due to engine failure in any kind of civilian helicopter operation.

° ° °

By the end of 1956 the Port of New York Authority will have spent or committed capital outlays of $135 million for New York International Airport.

° ° °

A $60 million "Terminal City" occupying 655 acres in the center of New York International Airport will provide gate positions for 140 aircraft plus 176 acres of aircraft apron.

° ° °

CAA reports the first recorded case where spraying water from an aircraft put out a forest fire unassisted. The fire covered fifty acres on a steep slope in Washington state.

° ° °

If you're planning a European trip this summer you can count on twenty percent more space on European airlines than last year. Another feature of the 1956 summer timetables will be direct flights to Moscow. No more changing planes at Helsinki or other central European points.

° ° °

The trip over is more likely to be by air than by sea. Foreign air travel edged past international steamship travel out of New York last year for the first time in history. More than a million passengers flew in and out of New York on international flights, compared with 923,000 going and coming by water.

° ° °

New airborne radar in the nose of modern airliners can spot heavy rain or snow up to 150 miles ahead.

° ° °

A crop-dusting pilot, winging his way from Wichita, Kan., to his home in Louisiana, landed in jail in Oklahoma.

The flying duster was out of gas and caught in a windstorm, and was lucky to be able to set down on the exercise yard of the Oklahoma State Penitentiary.

° ° °

The private flyer is now being aided by 10,500 air markers on the roofs and water towers of America. Over 2,000 of these aids to aerial navigation were installed during the past year. Virginia reported the largest number of new markers, followed by Florida and Ohio. New York installed markers on thirty-seven toll houses along the state's superhighways.

° ° °

There is one airplane for every 336 people in Nevada, but only one for every 6,880 persons in Alabama. The US average is one plane for every 2,601 people.

° ° °

Grant County, Neb., has the largest number of aircraft in relation to population—one plane for every thirty-six residents.

° ° °

Out of every 100 people flying into or out of New York, seventy-three are males and twenty-seven females. Their journey is most likely taking them to or from Chicago, Boston, Washington, or Miami. Thirty are professional people; twenty-eight are business officials or managers; twelve are housewives; nine are salesmen; five are students; five are members of the armed forces; five are secretaries or clerks; two are mechanics or factory workers; one is retired; and three are unknown or other.

Her name means "luxury" in many languages

Moving smoothly down the runway—this twin-decked Boeing Stratocruiser is about to take off on another routine over-ocean crossing.

For seven years Stratocruisers have spanned the U. S. and linked four continents. They have made more than 30,000 over-ocean crossings. They have carried more than 3½ million passengers and have flown nearly 200,000,000 miles!

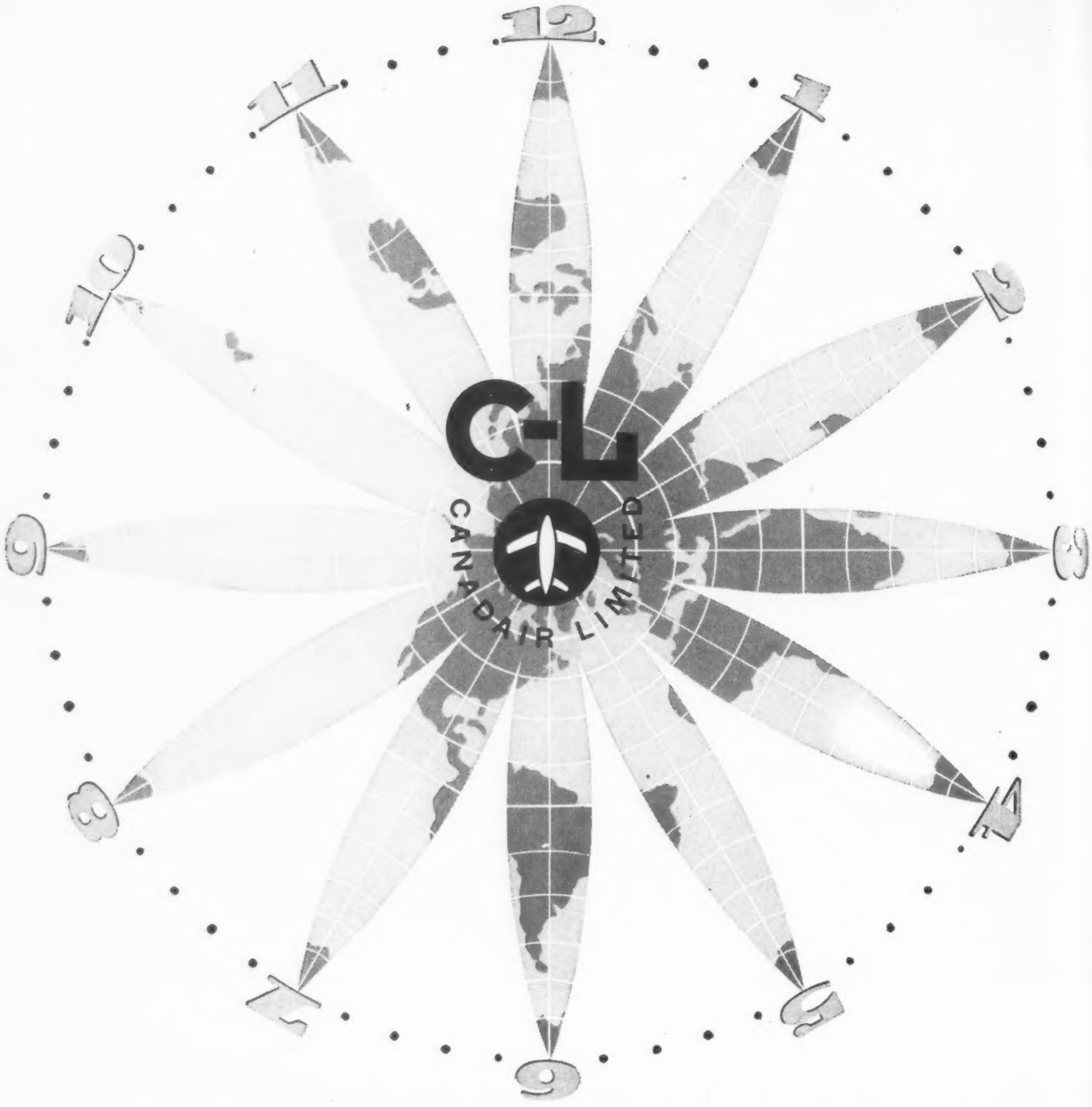
To her passengers the Stratocruiser represents the acme of luxury and comfort—just as did the Boeing 40s, the 80As, the 247 and the Stratoliner in their day. For Boeing-built transports have been carrying passengers over a longer continuous period than those of any other American company.

Roominess, comfortable extra-large seats, wide aisles, low sound level—these are some of the features which make the Stratocruiser the first choice of knowing travelers.

Great airplane that the Stratocruiser is, she will be far eclipsed by the Boeing 707s, America's first jet transports. These newest Boeings—the 707 Stratoliner and the Intercontinental—are now being built for leading American and European airlines. Deliveries start in 1958 with first service scheduled for early 1959.

These new Boeing jets will bring you new luxury, distance-devouring speed and unimagined smoothness of flight. They represent yet another outstanding Boeing contribution to air travel.

BOEING



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There are approximately 2000 Canadair-built aircraft in civilian and military service around the world. Wherever they fly, their operators know that Canadair's personal service on operational or maintenance problems is quickly available. Canadair technical representatives, at present based on four continents, are always on call . . . and as dedicated to the Canadair ideal of sales service as a family physician is to the needs of his townfolk.

These men have come from all parts of the world . . . from all spheres of aviation. They have been selected for their extensive knowledge of maintenance problems and for their specialized experience on the equipment in their charge. Their work is supplemented by aircraft systems trainers at the operator's own base; service repair and overhaul groups at the main Canadair plant, and a continuous flow of manuals, handbooks and bulletins. Around the clock and around the world, service is a continuing obligation to Canadair.

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AIRPOWER IN THE NEWS

■ Gen. **Curtis E. LeMay,** boss of our Strategic Air Command, has told the country that **his command is in trouble.** Testifying before the Senate Armed Services subcommittee investigating American airpower, the general said that the Air Force's **operating efficiency has been slipping** for the past four years, while at the same time, the Russians are "probably improving" their AF. He cited the "**lack of skilled manpower**" as his biggest deficiency and said that while the AF can't get enough men to reenlist, the main worry of the Soviet airman is that "he might be thrown out into the cold world." He urged that our airmen be given **more pay, better housing, medical care for dependents,** expanded commissary and post exchange service, and educational benefits comparable to those given war veterans.

General LeMay also warned that the US will be "inferior in striking power to the Soviet long-range air force by 1958-60," on the basis of present planning. He urged a step-up in airplane production, base construction, and research programs. He told the subcommittee, headed by Sen. Stuart Symington (Dem., Mo.) that the Russians are turning out heavy bombers faster than we are and now have more of them than we have B-52s (*see page 34*).

■ In May, the **Southwest Jet Age Conference** in Tulsa, Okla., **sponsored by AFA and the Tulsa Chamber of Commerce,** attracted 600 persons from a fifteen-state area. It was patterned after AFA's Washington Jet Age Conference in February and set the stage for aviation authorities to get together and discuss **Jet Age problems.** Among the highlights:

• **Air traffic control in the US is suffering** from the lack of a firm hand to decide which of a number of proposed solutions to use, according to **J. Francis Taylor, Jr.,** director of the **Air Navigation Development Board.**

• A nine-point program, outlined by **Clarence N. Sayen,** president of the **Air Line Pilots Association,** called for centralization in CAA of jurisdiction over flights, a single navigation system, expanded radar coverage, and a requirement that **all flights be made under instrument flight rules.**

In New York, the American Legion's "Billy Mitchell" award is given to Gen. Nathan F. Twining for his "contribution to aviation progress." Gov. Joe Foss of South Dakota congratulates him and Maj. Gen. Roger J. Browne looks on.

Tampa, Fla.—the Strategic Air Command becomes the first recipient of the Doolittle's Tokyo Raiders Traffic Safety Award. The trophy, in recognition of achievements in traffic safety, is presented to SAC's Gen. Curtis E. LeMay by National Safety Council president Ned Dearborn.

• **Charles J. Lowen, Civil Aeronautics Administrator,** said that a jet planning group had been established in CAA to provide a clearing house for all new information vital to military and civil aviation interests. He also said that CAA, in the next fiscal year, plans to start building five **new radar beacons** for tracking planes above 24,000 feet.

(For more on this conference, see "AFA News" in next month's AIR FORCE.)

■ **Gen. Alfred M. Gruenther** will resign his position as Supreme Allied Commander of the Armed Forces of the North Atlantic Treaty Organization and retire from the service late this year. General Gruenther told newsmen that he had been thinking of retiring for some time and felt that younger officers should be moved up to avoid "stagnation of ideas." His successor will be the present Air Deputy, **AF Gen. Lauris Norstad.** General Norstad, 49, will be the fourth US NATO supreme commander in Europe and the **first AF officer** to head an Allied Command of this importance. His predecessors—General Eisenhower, Gen. Matthew B. Ridgway, and General Gruenther—have all been Army officers. President Eisenhower —in a letter to the North Atlantic Council nominating him—**termed General Norstad "an officer of outstanding ability."** A 1930 graduate of the US Military Academy, General Norstad served in Europe during World War II, at one time directing operations of the Mediterranean Allied AF. He **has held key assignments in Europe since 1950** and has been SHAPE Air Deputy since 1953.

■ A leading figure in the US aviation industry, **Frederick B. Rentschler,** board chairman of the **United Aircraft Corp.**

(Continued on following page)

since 1935, died on April 25. Born in Hamilton, Ohio, and graduated from Princeton in 1909, he served with the Army Air Service at an engine plant in Brunswick, N. J., during World War I. In 1919 he helped found the **Wright Aeronautical Corporation** and in 1925 he founded **Pratt & Whitney.** Pratt & Whitney later merged with Boeing Airlines and Chance Vought Aircraft and became United Aircraft and Transport Corporation. Later, with controlling interest in another air carrier he formed **United, the first coast-to-coast airline.** Rentschler stayed with United Aircraft when, in 1934, the government compelled airlines and aircraft builders to go their separate ways.

■ **AIRPOWER NOTES.** . . . Because of the distance from the runway to the tower at Edwards AFB, Calif., tower operators frequently have trouble controlling aircraft under poor visibility conditions. So the AF is **installing a closed circuit television station** to monitor take-offs and landings. . . . The new **Office of Air Traffic Control,** established by the Civil Aeronautics Administration, will

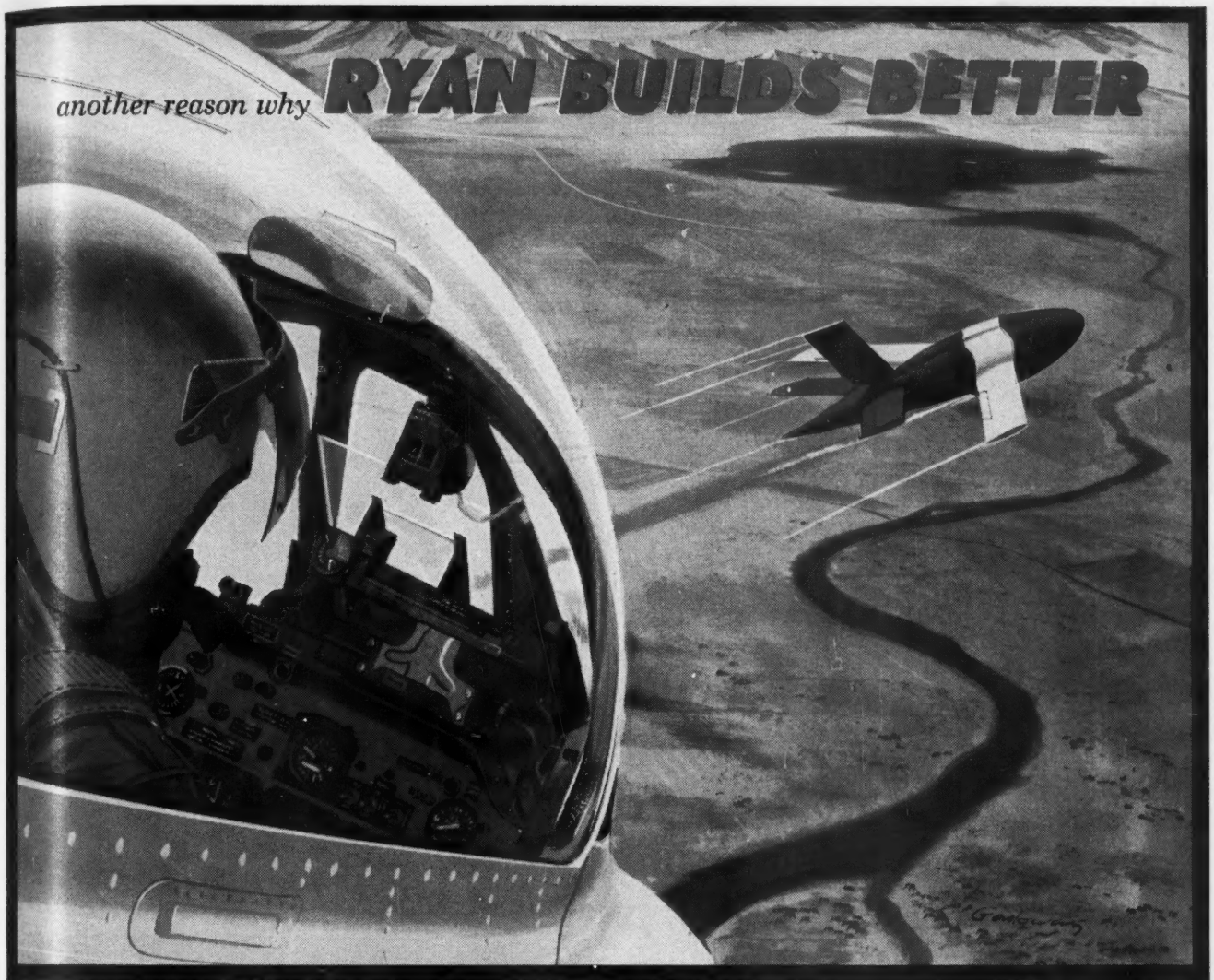
Board chairman of the United Aircraft Corp., Frederick B. Rentschler died in April. A leader in US aviation, he had helped found the Wright Aeronautical Corp. (1919), and Pratt and Whitney (1925).

be headed by **David D. Thomas,** deputy director of CAA's Office of Federal Airways. . . . The area around **Baltimore's Friendship International Airport** is being considered as a possible new headquarters for the **Air Research and Development Command.** The Command is presently in a group of private buildings in downtown Baltimore. . . . **Capt. Edward V. Rickenbacker,** chairman of the board of **Eastern Air Lines,** has been appointed a member of the **National Advisory Committee for Aeronautics** by President Eisenhower. He succeeds to the vacancy caused by the death of **Ralph S. Damon.**

■ **STAFF CHANGES.** . . . **Brig. Gen. Stoyte O. Ross,** Commander, Headquarters Command, USAF, will replace **Brig. Gen. Thomas C. Darcy** as Chief, Military Assistance Advisory Group, in Denmark, in July. **Maj. Gen. Reuben C. Hood, Jr.,** Commander, Caribbean Air Command, will fill the position vacated by General Ross. . . . **Brig. Gen. Jermain F. Rodenhauser,** Chief of the Plans Division in the office of Defense Advisor, US Regional Organization, North Atlantic Mediterranean Area, has been advanced to Deputy Defense Advisor and Deputy Representative of that office. . . . **Brig. Gen. Emmett B. Cassady,** Air Attache, Italy, will replace **Brig. Gen. Raymond L. Winn** as Director of Transportation and Services, AMC, in October. General Winn will report on June 1 for duty as Director of Transportation, DCS/Materiel, Hq. USAF. . . . **Maj. Gen. Thomas B. McDonald,** Assistant for Logistics Operations, DCS/Materiel, Hq. USAF, will replace **Maj. Gen. William M. Morgan** as Director of Materiel, J-4, US European Command in June. General Morgan will become Commander of the AF Cambridge Research Center,

Gen. Alfred M. Gruenther, left, is resigning his position as Supreme Allied Commander of NATO and retiring from the service late this year. He will be replaced by the AF's Gen. Lauris Norstad, the present SHAPE Air Deputy.

ARDC. . . . **Brig. Gen. Troup Miller, Jr.,** Commander of the Northern Air Materiel Area in Europe, will be assigned as Commander of the Arnold Engineering Development Center, ARDC, in July, replacing **Maj. Gen. Samuel R. Harris, Jr.,** who will retire. **Brig. Gen. Frederic H. Miller, Jr.,** Deputy Vice Commander, AMC, will fill the position vacated by Brig. Gen. Troup Miller, Jr. . . . **Brig. Gen. Pearl H. Robey,** Commander, Central Air Materiel Area, Europe, will report in September for duty as Commander of the Ogden Air Materiel Area, AMC. . . . **Brig. Gen. Daniel S. Campbell,** Deputy Commander, Air Proving Ground Command, will be replaced by **Brig. Gen. Richard T. King** in July. General Campbell will become Deputy Chief of Staff, US European Command. General King's position as Chief of the Policy Div., Director of Plans, DCS/Operations, Hq. USAF, will be filled by **Brig. Gen. Dale O. Smith,** who serves with the National Security Council. . . . **Brig. Gen. Maurice A. Preston,** Commander of the 4th Air Division will become Deputy Director of Operations, DCS/Operations, Hq. USAF. . . . **Maj. Gen. George F. Smith,** Chief of Staff, Air Defense Command, will assume command of the Central Air Materiel Area, Europe, in July. . . . **Brig. Gen. Ralph E. Koon,** Deputy Director of Operations, DCS/Operations, Hq. USAF, will become Vice Commander, Pacific Air Force in July, replacing **Brig. Gen. Thomas J. Gent, Jr.** General Gent will become Commander of the 314th Air Division. . . . **Brig. Gen. Richard J. O'Keefe,** Director of Supply and Services, DCS/Materiel, Hq. USAF, will be reassigned as Chief, Military Assistance Advisory Group, Saudi Arabia, and Commander of the 2d Air Division. . . . **Brig. Gen. John B. Cary,** Commander, 35th Air Division, will become Deputy Director of Plans, DCS/Operations, Hq. USAF, on July 1. . . . In July **Brig. Gen. Edward H. Porter,** Assistant Chief of Staff, Intelligence, USAFE, will be reassigned as Director of Intelligence, J-2, US European Command. . . . **Brig. Gen. Edward N. Backus,** Commander, 39th Air Division, will assume command of the 35th Air Division in August. . . . **Maj. Gen. Earl W. Barnes's** promotion to Lt. Gen., announced in April, will become effective on June 20. His position as Deputy Commander, TAC, will be filled by **Maj. Gen. William D. Eckert,** now Assistant DCS/Materiel, Hq. USAF. **Maj. Gen. Mark E. Bradley, Jr.,** will replace General Eckert. General Bradley's present position of Deputy Commander in Chief, USAFE, will be filled by **Maj. Gen. Herbert B. Thatcher,** Assistant DCS/Development.—END



"ENEMY" JET AT ONE O'CLOCK!

The ultimate target for a weapons system is the enemy. Lacking that ultimate target for training, the jet-powered Firebee has been developed by Ryan. It is the first realistic target which can "stand-in" for the enemy to sharpen the sights of the pilots, gunners, missile crews and radarmen who man America's defense system. No other vehicle can be used so effectively to evaluate new weapons systems.

Remotely controlled, the Firebee is a jet-fast "flying bull's-eye" that can operate at the extremely high speeds and high altitudes of modern air combat. Launched from the air or ground, and recovered by parachute, it is economical, not only in original cost, but also throughout its extended operational life, because it can be used over and over again.

Currently in production and being used operationally, Firebees have been delivered to all three military services—Air Force (Q-2A), Navy (KDA-1) and Army (XM21).

The Firebee is dramatic proof of Ryan's skill in blending aerodynamic, jet propulsion and electronics knowledge to solve a complex aviation problem... meet a military need. Ryan's jet-powered VTO now being tested at Edwards Air Force Base is another example of Ryan's forward-looking engineering ability.

Engineers looking for a challenging future will find outstanding opportunities at Ryan.

With a background of 33 years of experience in aviation, Ryan excels in designing and producing high quality aircraft, power plants and avionics, built at low cost, delivered on time.

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AIRMAN'S BOOKSHELF

In *The Air Force: A Panorama of the Nation's Youngest Service* (Gilbert Press, $5), newspaperman Arnold Brophy, a staff writer for the Long Island, N. Y., paper, *Newsday*, weaves thousands of facts about the AF and the aircraft industry into highly readable prose. Mr. Brophy uses a hypothetical air attack on the US as a framework, and in this context describes the history, mission, composition, and combat capability of the various major air commands. He rounds out the volume with a section on industry. Unfortunately an approach of this sort precludes serious analysis of significant air operations or the study of air doctrine, strategy, and tactics, without which the complete story of American airpower cannot be told. Mr. Brophy's book, however, which is factually accurate and rich in Air Force background, is valuable as a compilation and should be popular among laymen and handy as a reference work. Brig. Gen. Robert L. Scott, Jr., chief of AF Information, wrote the foreword.

Three new airpower books by British authors deserve comment. Best and most thrilling is *Squadron Airborne*, by Elleston Trevor (Macmillan, $3). This excellent novel is set in an RAF fighter squadron during the heavy German attacks against England after Dunkirk. The story is filled with air action, brave deeds, and imparts to the reader the sense of imminent death that haunted the British air defenders. If you liked *The Dam Busters*, you'll enjoy this one, too.

Another British book now out in American edition, *The Direction of War*, by Air Vice Marshal E. J. Kingston-McCloughry, RAF (Frederick A. Praeger, $4), studies all aspects of military conflict in terms of high command situations. The author starts with Marlborough and analyzes military leadership through World War II, tracing the beginnings of air warfare, its development, Allied planning in World War II, and the effect of nuclear weapons on traditional strategy. This is a unique and worthwhile contribution from an outstanding professional airman.

Still hunting for an American publisher is Sir John Slessor's *The Central Blue: Recollections and Reflections* (Cassell, London, 30/net). This is the third book by the distinguished Marshal of the RAF (the others were *Airpower and Armies* in 1936, and *Strategy for the West*, 1954). In it, Sir John combines the autobiography of a great military leader and airpower pioneer with an account of the development of British airpower since World War I. After six chapters dealing with Sir John's RAF career before 1938, the book deals with his activities from Munich through the end of World War II. In this book, Sir John provides record, comment, and interpretation of combat air action, anti-sub warfare, and postwar airpower problems. Informative, with a pleasing tone of informality.

Survival in the Sky, by Charles Coombs (William Morrow, $3.75) rates tops in the deluge of recent writing on the human factors problems introduced by high-speed, high-altitude flight. The story tells about the work being done by aeronautical engineers, aviation medicine specialists, and test pilots to keep pace with the rapid technological progress in aeronautics. Profusely illustrated with photos and drawings, this book is particularly tailored for the teen-ager and young adult. It will interest the air-minded of all ages.

New reprints on the paperback stands: Roger Burlingame's *General Billy Mitchell: Champion of Air Defense* (Signet, 35¢) and the World War II best seller *God Is My Co-Pilot*, by Brig. Gen. Robert L. Scott, Jr. (Ballantine, 35¢).—END

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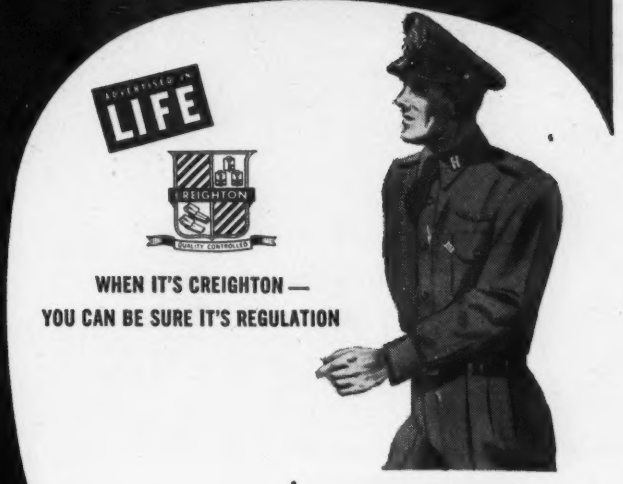

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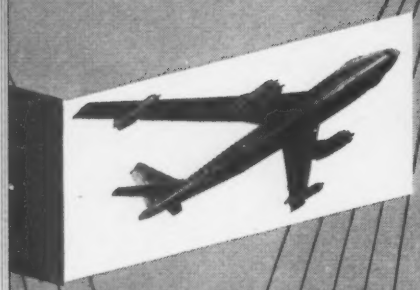

THE GPE CAPACITIES

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Precision Mechanics, Optical Devices, Ceramics	●●●	●●	●●	□●●	●●	●●●		●●	●●●	□●●	●●	●●	●●	●●●
Electrical Equipment and Components	●●●	●	●			●●●		●●●	●●	□●●	●	●●	●	●●●
Electronics	●●●	●●	●●●	●●●		●●●		●	●●	□●●		●●●	●●	●●●
Hydraulics, Liquids Processing, Heat Exchange		●●			●●●		●●●					●●●		
Television: Studio, Theatre, Institutional, Business, Industrial	●	●		●●●		●						●		
Instruments, Servos, Controls: Hydraulic, Pneumatic, Magnetic, Electronic	●●●	●	●●	□●●		●●●	●●●	●●	●●	□●●		●●●	●	●●●
Aircraft and Missile Guidance, Control, Simulation	●●●	●		●●●		●●●		●				●●	●	●●●
Automatic Computers and Components	●●●	●	●	□●●		●●●						●●●		●●●
Radar, Microwave, Ultrasonics	●●●	●	●●	●●●		●●			●	□●●		●		
Motion Picture and Audio Equipment		●●●		□●●				●●	●●●		●●●		●●●	
Nuclear Power Components and Controls	●●●				●●					□●●		●●		●●●
Systems Engineering: Aeronautical, Naval, Industrial	●●●			●●●	●●●	●●●	●●●			□●●		●●●		●●●

I Kearfott Company, Inc.; Little Falls, New Jersey
II International Projector Corporation; Bloomfield, New Jersey III Bludworth Marine; New York
IV General Precision Laboratory Incorporated; Pleasantville, New York V The Griscom-Russell Company; Massillon, Ohio
VI Link Aviation, Inc.; Binghamton, New York VII Shand and Jurs Co.; Berkeley, California VIII The Hertner Electric Company; Cleveland
IX The Strong Electric Corporation; Toledo, Ohio X Precision Technology, Inc.; Livermore, California XI J. E. McAuley Mfg. Co.; Chicago
XII Askania Regulator Company; Chicago XIII Ampro Corporation; Chicago
XIV Librascope, Incorporated; Glendale, California

● Manufacturing ●● Manufacturing and product development ●●● Manufacturing, product development and research

□●● Pilot manufacturing, product development and research

to "speak softly..."

More than a year ago, one of the operating companies of General Precision Equipment Corporation—after nearly 8 years of joint development work with the Air Force—placed in scheduled production the most advanced air navigation system known to exist. Called AN/APN-66, the system is based on "Doppler effect," a known natural phenomenon, but one which others said could never be applied to aviation engineering. Its successful development brought to culmination still another notable aviation engineering "first" by a GPE Company.

AN/APN-66 and related systems adapted for specific purposes compute air position with unprecedented accuracy and speed. They work independently of any ground-based reference, optical or electronic; are the only operational systems that are global. They provide a vitally needed element in the defensive-offensive power our country must have to speak softly, yet negotiate from strength.

For months now, these systems have been functioning as brain and nerve center in a substantial number of the Air Force's newest craft. In millions of miles of operational flight they have demonstrated their engineering genius. When put to civilian use, they will guide air liners to the remote corners of the globe with equal accuracy. Then, never again need a plane get lost anywhere... in any weather.

While the GPE Company primarily responsible for this AN/APN equipment is General Precision Laboratory, the systems are typical products of GPE Coordinated Precision Technology. Four other GPE Companies—Askania, International Projector, Kearfott and Librascope—participated with GPL in providing the components that made them possible. All now manufacture portions of the equipment.

As the chart on the opposite page shows, all of the producing companies in the GPE Group work in highly advanced fields. GPE Coordinated Precision Technology, a basic GPE operating policy, gives each GPE company access to the skills and facilities of the others and coordinates those which are relevant. This coordination has played an important part in amplifying the capabilities of all GPE companies, enabling them to solve highly advanced technological problems with vision. Frequently, as with these AN/APN systems, frontiers of science are pushed back on the way.

The GPE Producing Companies serve more than a dozen major industries. A brochure, "Serving Industry through Coordinated Precision Technology," describes their fields in some detail. It may well suggest products or facilities applicable to problems your company is facing. For a copy or other information, write:

General Precision Equipment Corporation

92 Gold Street, New York 38, New York

SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE

AF personnel qualified to teach now have an opportunity to make a worth-while contribution to help solve the Nation's secondary school teacher shortage. In a letter to all ZI commands, AF Headquarters urges all AF members who meet local requirements to obtain temporary certificates for off-duty teaching. The program—concerned mainly with the teaching of such subjects as science and mathematics—was established because the AF is concerned about the small number of scientists now being trained in US school systems in comparison to the emphasis in this field by the Russians. Calling attention to this fact in a recent speech, Secretary of the AF Donald A. Quarles said: "To meet the challenge we need to . . . build up high school instruction in mathematics and the physical sciences, reversing the recent very serious downward trend in these subjects."

The plan was recommended by Maj. F. D. Henderson, an Air Staff Officer in Hq., USAF, and applies to airmen and officers on active duty and retired persons, as well as civilian employees. Base education services officers and base education advisers will help with the job interviews, certification and placement. Any financial arrangements will be made between the individual and the school.

In announcing the program, the AF made it clear that education is a responsibility of local and state governments, and private schools. But AF leaders feel that members who so desire can make a contribution toward solving the current teacher shortage.

For those who get tired, as we do, of seeing small parts photographed in the palm of someone's hand or simply beside some unknown finger—the above shot from General Electric should be a welcome relief. The eyes belong to Norma Jean Veglia, and on her fingers are a pair of jewelry-sized turbine blades which weigh only 1/5 of an ounce each, but exert a pull of a half ton when whirling around in G.E.'s T-58 turboshaft engine. The engine is a 1,000-horsepower gas turbine which will be used to power Navy helicopters.

☆

Leroy J. Wanlass, based at Hamilton AFB, Calif., leads a double life. Most of the time, he is M/Sgt. Leroy J. Wanlass, chief clerk for plans and requirements, Hq., Western Air Defense Force—but on Wednesday nights, he is Lt. Col. Leroy J. Wanlass, a Flight Commander for the 9364th Air Reserve Squadron. Seems he was first separated from the service as a captain in 1946 and reenlisted as a non-com. He was recalled in 1952, as a major, and after another separation he reenlisted again as a master sergeant.

☆

Good advice, from the Army's Chief of Staff, Gen. Maxwell D. Taylor—"It is not easy for a democracy to protect itself absolutely against military surprise. An alert aggressor, by carefully picking time and place, by creating an atmosphere conducive to peaceful relaxation and wishful thinking, always has the possibility of perpetrating a surprise on an unwary, unaroused nation."

☆

The Strategic Air Command is trying to locate AF members who were assigned to the 91st Strategic Reconnaissance Squadron (Medium) from July 28, 1953, to June 1, 1954, because these men are eligible for the AF Outstanding Unit Award. Those eligible for the award should notify their commanders, so that lists may be prepared and forwarded to SAC headquarters. SAC will prepare and issue individual certificates and ribbon bars to those who qualify.

☆

Though not Air Force, we found this amusing. According to the New York *Times*, "During recent operations off the Pacific Coast, a rescue diving bell was dropped to the guppy-type submarine *Diodon* that was playing dead on the ocean floor. When the bell reached the sub, out stepped a Navy paymaster and paid off the crew, right on schedule."

☆

Reporting on the crash of a British transport plane, the Boston *Herald* said the accident would have been much worse, except for the fact that the passengers in this particular plane were seated backward. "The idea of riding backward," according to the story, "bothers some people. It is more natural to look forward because you walk forward. People like to see where they are going. But it is also easy to see how the shock of a crash might be better absorbed if it was distributed up and down the back of the passenger rather than concentrated on his seat-belted pelvis."

Most safety experts agree with this, but, except for a few instances—MATS is trying it—the idea hasn't caught

(Continued on page 27)

RADAN*

THE PIN-POINT NAVIGATION SYSTEM JET LINERS NEED

another GPL first

A billion dollars worth of jet air liners are building—*tremendously fast, fuel-hungry air liners.*

The vital navigation problems these jets pose—problems affecting both the safety and economy of commercial jet operations—have been solved by GPL's RADAN Navigation Systems.

RADAN Systems are the most accurate airborne navigation systems an air line can buy. They are completely self-contained: need neither ground aids nor celestial fixes. They will work anywhere in the world, under any conceivable conditions.

RADAN Systems enable a pilot always to pick the quickest route to his destination —and stay on it. RADAN-equipped planes will keep safely in their air lanes, require less air space, come in on-the-dot. Thus, by reducing airport congestion and delays, RADAN will add to passenger comfort and satisfaction. Moreover, RADAN Systems cut flying time to a minimum—and every second trimmed from air time saves air lines many dollars.

RADAN Navigation Systems are typical of the many notable components, equipments and systems that have resulted from GPL's advanced technological resources and engineering skills.

For further information, or help with a specific technological development problem, write to:

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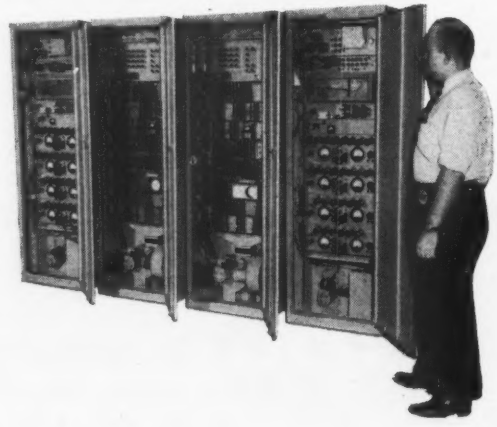
Conceived by the Air Force and developed in close cooperation with M.I.T.'s Lincoln Laboratories...CDT is another example of Lewyt's engineering skill and resourcefulness in the application of the most advanced electronic techniques.

A brochure of other case histories is available by writing: LEWYT MANUFACTURING CORPORATION, Department AF-6, Brooklyn 11, N.Y.

**Coordinate Data Transmitter System*



LEWYT

on. As the *Herald* says in conclusion: "Would it really be so bad to see where you have been hather than watch where you're going—it if might save your life?"

☆

Here is good air base-community relations. During a hospital dedication at McConnell AFB, Wichita, Kans., Wichita's Mayor Claude DeVorss gave the base a "certificate of appreciation" praising it "For meritorious service, friendliness and neighborliness."

☆

Bound to add another wrinkle to the brow of those who are genuinely alarmed at the strides being made by the Russians, is the news that the Reds are already building a device that our own Atomic Energy Commission is just now planning to build. According to AEC Commissioner Willard F. Libby, the device—a ten- to twelve-billion electron-volt proton accelerator—will give the Russians a lead in high-energy research. "When their machine starts," Libby said, "the Russians are going to take over the show for several years. . . . On this accelerator the particular aim is to get the lead back from the Russians as quickly as we can. It isn't only a matter of competition with the Russians. We know that the new and important things in nuclear physics lie in this range." This "A-bomb" was dropped by Dr. Libby before the Senate-House atomic energy committee in February, but was just made public last month.

☆

We just heard that an unidentified man called a base commander to say, "Sir, my bridge partner has made four bids that I haven't heard because of your airplanes. At ten cents a point, I can't afford this."

☆

We were glad to see that the hero of one of our past articles (see "Seventy-Nine Hours," May '55 AIR FORCE) has been honored for his heroic actions. Capt. Thomas L. Pittman of the 22d Bombardment Wing, Fifteenth AF, SAC, March AFB, Calif., was given the annual Aviator's Valor Medal by the New York City Aviators Post #743 of the American Legion in May. The citation accompanying the award read: "For extreme valor and fortitude displayed in his attempt to save the life of a fellow crew member who was rendered unconscious during a mid-air explosion and disintegration of a B-47 aircraft. Although seriously injured, Captain Pittman crawled forward in a courageous attempt to eject the observer's seat and pull the parachute release. The heroic determination and self-sacrifice displayed by Captain Pittman reflect the highest credit upon himself and the United States Air Force."

☆

We received the following items about reunions too late to include in our "Rendezvous" column—so here they are:

The 2d Service Squadron of the Fifth AF plans a reunion at the LaSalle Hotel, Chicago, Ill., on July 9, 10, and 11. Former members are asked to contact Carroll E. Cornett, 5304 N. Sapulpa, Oklahoma City, Okla., for details.

The 409th Bomb Group (L) is holding its fourth reunion at the Hotel Carter, Cleveland, Ohio, on July 13, 14 and 15. Former members should contact Bernard B. Bernstein, 6514 N. Albany Ave., Chicago 45, Ill.

The Flying Tiger Association and the Fourteenth Air Force Association will hold a joint convention on July 12, 13 and 14 in Milwaukee, Wis. All former members of the

American Volunteer Group, China Air Task Force, and the Fourteenth Air Force are invited. For more information, contact Dr. Richard O. Bauman, 425 East Wisconsin Ave., Milwaukee 2, Wis.

☆

In case anyone is still wondering why defense in this day and age comes so high, we think this little item from a recent issue of The New York *Times* should drive the point home. Quoting a House Appropriations committee report on the Defense Appropriation bill, the *Times* said, "As an item of interest, it might be pointed out that the assist take-off units, or JATO [jet-assisted take-off], as they are commonly called, cost about $160 each. A B-47 jet bomber, fully fueled and combat-loaded, requires about thirty of these units to assist in the take-off. Thus it may cost as much as $5,000 to get one of these bombers, fully loaded, off the ground. Until recently, these assist take-off units cost nearly three times the present price."

☆

A headline we saw in the St. Louis *Post-Dispatch* the other day said that "Defense Department Order on Cutting Grass Mowed Down in House." It seems that the House Appropriations committee feels the Department of Defense should spend more time on policy and less on detail. For example, the order telling soldiers to cut the grass when it needs it reads, "Mowing schedules shall be regulated by the amount of growth. Equipment should be selected that will provide the most economical and efficient mowing. . . ." In other words, "when the grass needs cutting, cut it." The committee felt that the directives were too wordy and too long to even be read, much less followed. The *Post-Dispatch* suggested that the Congressmen look at the directive on refuse collection "which takes about 430 words to say that garbage, trash, ashes and debris should be collected often enough to prevent containers from overflowing."

☆

Col. Barney Oldfield, Director of Information Services for the Air Defense Command (he wrote the story on the Ground Observer Corps beginning on page 87) has done an account of the care, feeding, and coddling of the World War II war correspondent. It will be published by Duell,

(Continued on following page)

Sloan & Pearce of New York, and be out in October 1956 under the title of *Never a Shot in Anger*.

Another publication that should be of interest to our readers came across our desk the other day. *USAF Aircraft 1947-1956*, by James C. Fahey, is packed with useful data and pictures, making it indispensable to anyone actively in aviation, or just interested in aviation. Published and distributed by Ships and Aircraft, Box 548, Falls Church, Va., it sells for $1.50. Enclose a check or money order when writing, says Jim Fahey.

By a strange coincidence, Arnold Brophy, author of *The Air Force* (*see* "Airman's Bookshelf," page 21), is also the newspaper reporter who did a series of articles in Long Island's *Newsday* urging that Mitchel AFB, N.Y., be closed.

☆

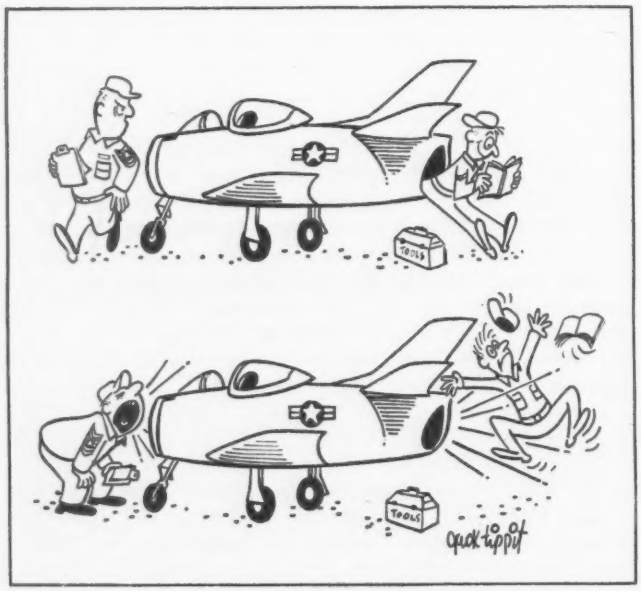
The annual meeting of the Air Force Historical Foundation will be held on Friday, June 15, 1956, at the Officer's Club of Bolling AFB, Washington, D.C. It will include a Symposium on Airpower consisting of two papers —"Airpower in Being," and "Airpower Potential." At the morning session, beginning at 10:00, six members will be elected to serve four-year terms on the Board of Trustees. Foundation members unable to attend may vote by using the ballot included in the April issue of "The Air Power Historian," and mailing them to the office of the Foundation before June 13, 1956. Membership in the Foundation may be acquired by sending $3.00 to the Executive Director, The Air Force Historical Foundation, Maxwell AFB, Ala. This includes the receipt of the Foundation's quarterly publication for one year.

☆

In case you questioned our article of last month, which outlined the Army's interest in strategic airpower, we'd like you to know that the Army is now exploring, under contract, possible sites for a 5,000-mile missile test range.

☆

Ever since Arthur Godfrey plugged AIR FORCE Magazine on his radio and television shows (see "Shooting the Breeze," May '56), things have been further from normal than usual around our offices. But we are once again settling back into our comfortable "near-normal" state. At last count, we had received 159,374 requests for copies of our April issue, which featured a special report on the Strategic Air Command. We condensed the SAC material into a twenty-four-page reprint, and it is now being mailed to all those who requested it.



☆

The latest in hats for Ground Observer Corps volunteers is a number known as the "Buzz Bonnet." Developed by the Rome Air Development Center, it is a plastic helmet with a detection set mounted on it. Signals from radar sets of approaching aircraft are picked up by the detector and made audible to the observer through a light-weight earphone in the helmet.

☆

Here are the rules for the 1956 AF Group Singing Contest to be conducted next fall and early winter. The competition is open to all AF levels and finals will be judged in early December. Each competing vocal group will tape-record two selections in its chosen category of competition—country and Western singing, popular singing, spiritual singing, barbershop quartet, small chorus, large chorus, and singing squadron. All individuals in a winning group will receive medallions and additional awards will go to bases of the winning groups.

☆

There's a point we feel compelled to comment upon from time to time with respect to those of our authors who are on active duty in the Air Force. We would like to make it clear that their articles do not necessarily reflect either official policy of the US Air Force or policy of the Air Force Association.

☆

The AF has initiated a program to try to get more of the young, obligated-tour officers to remain on active duty. AF Chief of Staff Gen. Nathan F. Twining said he hopes the new program will produce a positive desire on the part of the young officer to make the AF his career. While much has been done in the last two years to improve career service in the AF, personnel officials at Headquarters feel that junior officers do not have complete knowledge of all these actions. The new program will bring this information to the attention of all junior officers on obligated two to four year tours—with the objective of retaining the trained men needed in today's Air Force.

☆

The 25th Annual National Model Airplane Championships will be held at the US Naval Air Station, Dallas, Tex., on July 23 to 29. Maurice Teter of Dallas will be this year's contest manager.

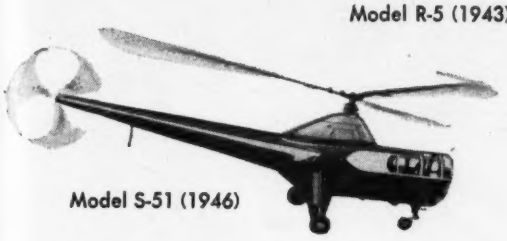
☆

According to the Daniel and Florence Guggenheim Aviation Safety Center at Cornell University, aircraft of "weird" shapes and strange behavior soon will appear in America's skies. And they aren't talking about visitors from outer space. The center says that the radical changes in appearance of aircraft "are resulting from the development of various types of vertical-rising and steep-gradient planes designed to increase safety and reduce aviation's dependence upon landing fields consisting of 'acres of concrete.' "—END

Model R-6 (1943)

Sikorsky R-4 (1942)

Model R-5 (1943)



Model S-51 (1946)

Consider Sikorsky,

for instance...

Model S-52 (1947)

The name of Igor Sikorsky is akin to magic when you mention helicopter aircraft.

And it suggests a few facts concerning another aviation pioneer: Goodyear.

Since the introduction of the Sikorsky R-4, Goodyear tires, tubes, wheels and brakes have been used on all Sikorsky helicopters.

Since that time (with the exception of approximately 100 surplus units provided by the military), every single Sikorsky helicopter using fuel cells has been 100% equipped with Goodyear cells.

In the R-5, R-6A, S-51, S-56 and S-58 models — Sikorsky has used rotor brakes also built by Goodyear Aviation Products.

The conclusion is obvious:

When pioneers pair up, the performance is topflight!

Goodyear, Aviation Products Division, Akron 16, Ohio, and Los Angeles 54, California.

Model S-55 (1949)

Model S-56 (1954)

Model S-58 (1954)

Model S-59 (1954)

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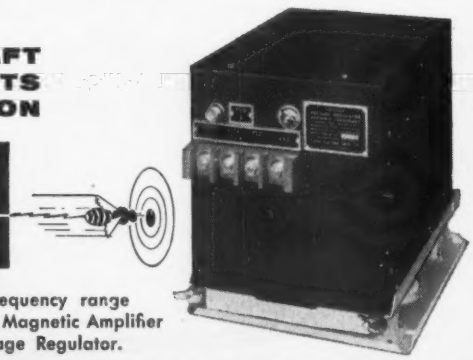

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The Army Has a 'Story', Too

The intent is to be neither facetious nor recriminatory, with reference to the number one engine of the March '56 issue of "Jet Blasts," entitled "AF Commanders for Army Divisions?"

The blast contained some rather unknowledgeable, irresponsible allegations and statements, and resurrected some arguments which were laid to rest (I thought) when the Army-Navy-Army Air Force team proved itself, chiefly in World War II, and more recently as the Army-Navy-Air Force team on a limited scale in the Korean action.

I do not believe that it can be either documented, or fathomed, that any responsible Army commander proposes to have the Army "regain its airpower." Unfortunately, in the nightmare of semantics in this running debate, airpower *per se* is being badly confused with air transport as a *mobility factor* and with *air support* for basically land-roving military forces. Current and critical Army air requirements lie not only in the spheres of evacuation, expeditious deployment of units, short-range reconnaissance, movements of men and "hardware" across river barriers, or small unit resupply drops, but to integrate long-range reconnaissance craft necessary to effectively employ current and anticipated "ground" weapons capabilities, to insure the *controlled* (unity of command) availability of close support assault aircraft, to have the technological means to swiftly disperse and concentrate troops, and to accommodate the *simultaneous* lift of significant numbers of personnel to include their logistical support on a sustained basis.

The Army Air Force became the USAF by virtue of the recognized fact that to fight for, and dominate, the air space was and is job enough in itself.

What plane currently available in quantity fills the bill to a "ground" commander's direct air support specifications?

What priority is given troop transport or close support in priority lists contained in Air Force doctrinal manuals? Of transports, they *do* exist in the Air Force. But there are not enough of them, and are *not* used "by the Army as it sees fit."

The lieutenant speaks of Army divisions as though their number could be contained in a control tower. Asher Lee in his *Air Power* records that in US military maneuvers in 1950 it was discovered that *one* Army corps (two divisions augmented by auxiliary arms and services) required for its supplies alone an airlift which would have utilized the whole of the United States' civil air lines. Considering the future battlefield where the "line" and its logistical surface tail will have given way to an *"area and a direction"* strategic-tactical system, transport and logistical support by air is not only the desirable way, but appears to be the *only* way. Where is *that* air?

The lieutenant's blast is an indication that one observation recently contained in another professional military journal is more than well-founded. It was to the effect that the normally excellent close support rendered ground forces in World War II was excellent in that air commanders and subordinate operational personnel had been basically Army-trained and were not only cognizant but appreciative of that service's mission requirements. This is no longer the case.

Let the lieutenant not gauge the "allocation of responsibilities" for the respective services by comparison of the allocated amounts of congressionally approved defense budget funds. If the lieutenant sees fit to inform me of his name and address, I would be more than happy to enter a subscription to *Army, my* service journal.

Capt. A. J. Siracuse

A Matter of Appreciation

Two sergeants were sitting at a table in the NCO Club, nursing a couple of beers.

"You going to re-up?" asked one.

"I don't know," the other answered. "Eight years is a lot of time to give up. Only twelve to go. But, dammit. I just don't know."

"What's your beef? You didn't make tech last month? There's no war on now, you can't get another stripe every few months any more.

"Hell, that's not it. I know I'll make tech in time. And I'll make master, too, before my twenty comes around. That's not it. I don't know just how to explain it."

"Listen, buddy. After ten years in the Air Force, nothing sounds screwy to me. I'm even half believing those yarns the kids tell in the barracks after they come back from leave."

"Well . . . you know I like my job. I've fooled around with engines since I was old enough to pick up a wrench. Crewin' this '86 is as good a job as I could ask for."

"Hey, waiter . . . two more, eh? . . . Okay, so you like your job. You thinking of that dough you maybe could make outside?"

"That's not it . . . take today, for instance. When the lieutenant came down to fly my plane she was in the best shape of any plane in the squadron. I'd just pulled a periodical on her and I was down at the hangar at five this morning to make sure everything was okay. I was real proud of that airplane. I had her out on the hardstand, all ready to go, when the lieutenant came up in a jeep. 'She's all set sir,' I said. 'Good,' he grunted. 'I'll check her out.' Well, he came back a couple of hours later, got out of the plane. 'How'd she go, sir?' I asked. 'Okay,' he said, 'but the windshield had some spots on it, and you left a rag in the cockpit.'"

"So?"

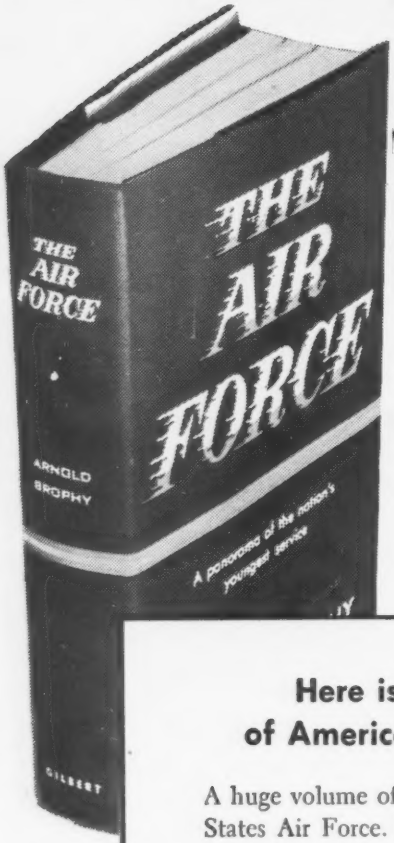
"So, dammit, I'm human too, even if I am an enlisted man. I knew how good a shape that plane was in. I

(Continued on following page)

"Screams the warning . . .

that, never again, dare we be 'too late with too little.' "

— CAPTAIN EDDIE V. RICKENBACKER



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JET BLASTS — CONTINUED

knew how much I'd worked to get her in that shape. I'd like to have somebody tell me that. But that lieutenant's just a robot—well, I guess he thinks I'm just a robot, too. But I remember in Korea. Hell, those pilots used to come down and ask if they could help us. They used to say, 'Chief, that airplane hummed today. She's sure in tune.' They used to make you feel as though you were just as important as they were. They were putting their lives in the hands of their crew chiefs and they knew it, and you knew it. And they were *appreciative.* When they said, 'Chief, you sure did a swell job on that airplane,' why, you'd be bustin' inside and you'd work twice as hard to get him to say it again. You're not a team now, any more. He's a pilot and you're just a grease monkey. I'm just a guy whose job it is to keep his plane in shape. His plane! Oh, he knows what to do once he's inside the cockpit. But that's all. His plane!

"What I'm trying to say is, it should be *our* plane. I don't mean we should be buddy-buddies—I believe in officers being officers and airmen being airmen just as much as they do. And I don't want any medals or citations for doing my job. But I would like to feel that somebody really appreciates what I do. I would like to feel as though I'm an important part of this deal. If it were just the money, I wouldn't have re-upped."

"Waiter . . . hey, how about fillin' these up? . . . I know what you mean. If that lieutenant would just come down to the line every so often, just ask how's everything going, maybe every now and then say, 'Chief, you take good care of *our* airplane,' maybe ask a few questions about your work —why, hell, you'd work twice as hard."

"Yeah, that's it. I could even kid myself into believing I was really somebody important, that they'd have a hell of a job replacing me. The way I feel now—who the hell cares whether I stay in or out?"

"I don't guess they'll ever understand, though. You have to sweat inside the guts of an airplane to learn what we're talking about. Or you have to have another war."

"You're right. And I sure don't want another war. I just wish, though . . . oh, hell, I wouldn't have told even you how I felt if I wasn't half beered up. It all sounds so damm silly when you think about it."

"I suppose it is. Com'n, let's go into town. They got a new singer at The Bacchus and she's all sex. . . ."

T/Sgt. Earl C. Nelson

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Second-Best Air Force

Boeing B-52. We're lagging behind the Reds in the heavy jet field—they have 100-plus, we have only seventy-eight.

ONE OF the most appealing scenes in "Peter Pan" is the moment when Peter confides to the children his secret of flight.

"Just think lovely thoughts," he says, "and before you know it you are flying."

Evidently many of our leaders feel that the same approach will give this nation the kind and amounts of military airpower it needs.

The wishful-thinking approach of "Peter Pan" is acknowledged fantasy, pure entertainment. But the wishful-thinking approach to national defense is neither amusing nor entertaining, although, like a good drama, it conveys a convincing illusion of reality.

In Washington last month, the drama was unfolding simultaneously on several stages. On one, a Senate subcommittee, chaired by Sen. Stuart Symington (D., Mo.) was trying to unravel the airpower puzzle under a directive to investigate "the present and planned strengths of the United States Air Force."

In opening the hearings, Senator Symington said: "The first phase will include witnesses eminently qualified to testify as to developments in the military situation since the end of World War II."

These "eminently qualified" witnesses did much to put the problem into perspective. Said retired Army General Walter Bedell Smith, former chief of staff to General Eisenhower, former ambassador to the Soviet Union, and former head of the Central Intelligence Agency:

"I myself, and I believe a great many others, underestimated the ability of the Soviet Union to overcome [its] handicaps [in science and technology]."

General Smith went on to say that "in view of the sweeping scientific and technological developments in the past ten years, the military strength of any country at any given time rests largely on its force in being" and that this force's "long-term defense potential is continuously dependent on keeping ahead or, *at the very least*, abreast of any potential aggressor."

Another eminent retired Army general, former Chairman of the Joint Chiefs Omar N. Bradley, amplified the need for a force in being:

"One point should be stressed," said General Bradley. "To be effective, either as a deterrent or as a defensive factor, airpower must be in being. That is, a strong Air Force must be immediately available and have the ability to act at once. This implies the existence of the necessary planes, both in number and in performance capacity. It also implies all the other elements required to make them effective, i.e., trained personnel, and air bases strategically placed, amply supplied, and fully protected."

The Air Force's first Chief of Staff, Gen. Carl A. Spaatz, agreed with the force-in-being philosophy but went a necessary step further. He was asked, "As of today, General, do you think our Air Force is competent to meet a surprise Russian attack?"

General Spaatz replied that he thought it was but added:

"I thought what this committee wanted to know was what you needed today for the armed forces of the future. We cannot do anything about today's forces. They were decided four or five years ago by the appropriations. . . . It is what will happen from here on out [that is important], not what our forces can do today."

In the context of these statements, it is interesting to examine the testimony of Gen. Curtis E. LeMay, Commander-in-Chief of the Strategic Air Command. On our present capability, General LeMay agreed with General Spaatz that SAC could take care of

ls Now Official

An AIR FORCE Magazine Staff Study

itself. But this could not be done "without this country receiving very serious damage. Five years ago we could have won the war . . . without serious damage."

And things will get worse before they get better under current programming. The SAC commander pointed out that we were falling behind with every tick of the clock, with every flip of the calendar.

In heavy jet bombers the USSR has already passed us, with well over 100 Bisons, comparable to our B-52. We have on hand seventy-eight B-52s of which only forty-seven are currently flyable. Only in the medium bomber class are we ahead, with our B-47 force far outnumbering the Red Badgers. Our present program, said General LeMay, will leave this nation "inferior in striking power to the Soviet long-range air force by 1958-1960."

As to other elements of the force in being, a personnel briefing by Brig. Gen. Horace M. Wade, SAC Director of Personnel, left little doubt that the efficiency of the force inevitably will be seriously damaged by high turnover of hard-skill technicians. Terming a lack of skilled manpower his "most critical deficiency," General LeMay said the time may come when "we are not going to be able to man the planes we have" (*see* AIR FORCE, April '56).

In the field of hardware, General LeMay pointed to a lack of existing and programmed jet tankers as a major worry. The programmed ratio of tankers to bombers is, in his opinion, too low, and he pointed out that "we could increase our intercontinental strike capability considerably from our planned base structure and with the same size of bomber force if we had more tankers than we are now programmed to have."

Deficiencies in the base structure, with resultant overcrowding and increased vulnerability, are bothering SAC, according to its boss. A speed-up in construction of currently programmed bases would help, but even this "will still not provide the desired degree of dispersal and will not give the desired base posture."

Wide World Photos, Inc.

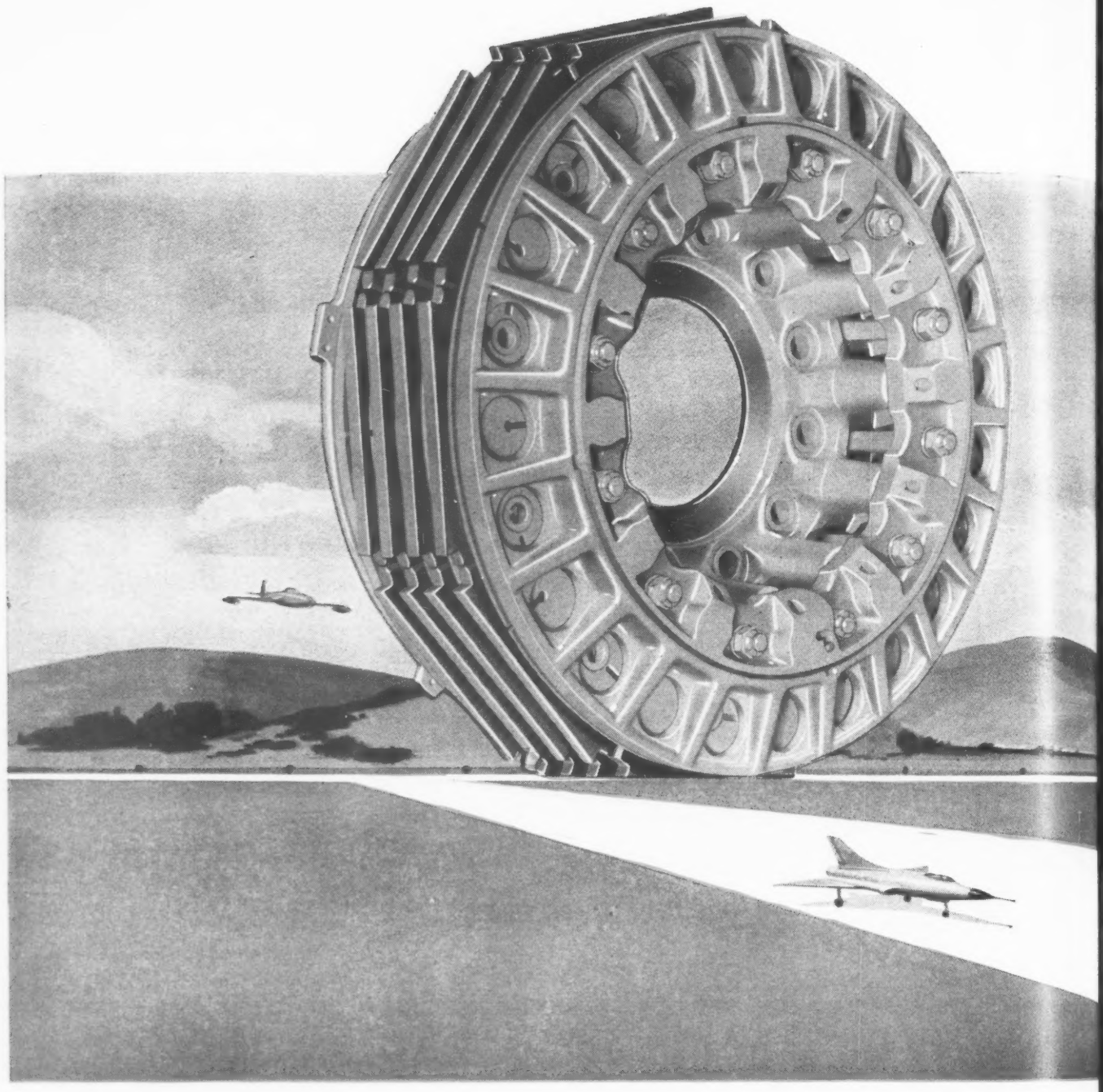
From left: SAC Commander Gen. Curtis E. LeMay, Maj. Gen. J. P. McConnell, SAC Plans Director, and Sen. Stuart Symington at the Senate's investigation into US airpower.

Wide World Photos, Inc.

From left: AF Secretary Donald A. Quarles talks with his budget chief, Maj. Gen. Frank A. Bogart, and AF Chief of Staff Gen. Nathan F. Twining before his Senate testimony.

General LeMay's testimony, sanitized for an open hearing, had considerable editorial impact. Said the New York *Journal-American:* "It [a stepped-up airpower program] will cost money, but immeasurably less than a war of survival. And General LeMay speaks with the voice of compelling authority." The New York *Herald Tribune:* "We must continue to keep that margin of leadership in airpower and atomic weapons which on this less than ideal globe remains the compulsive deterrent for peace. It will be costly but there can be no real option." The Washington *Post and Times Herald:* "The instruments of major weapon delivery, meaning in the present context heavy bombers, are an essential factor in the deterrent to all-out war. And, whatever the Soviet economic and political tactics, military strength remains fundamental in protecting the Free World interest. It has long been evident that the bargaining power of the United States increases in direct proportion to Russian respect for American military capabilities." The Philadelphia *Inquirer:* "Perspective on this issue must be maintained. No one in a position to know all the facts has suggested that Russia is NOW ahead of the US in air striking power. The danger is in the future, more than at present. . . . The picture of Russia building more of these bombers than we are and being in a position to have more in readiness than we have, cannot fail to be profoundly unsettling." The Washington *Star:* "The years 1958-1960 are close at hand. Those who have the ultimate responsibility for the national security should not be content for time alone to prove that we can get safely by with the present effort—or worse, that we cannot." The Washington *Daily News:* "In today's world there is no place for a second-best Air Force. We can-

(Continued on page 105)



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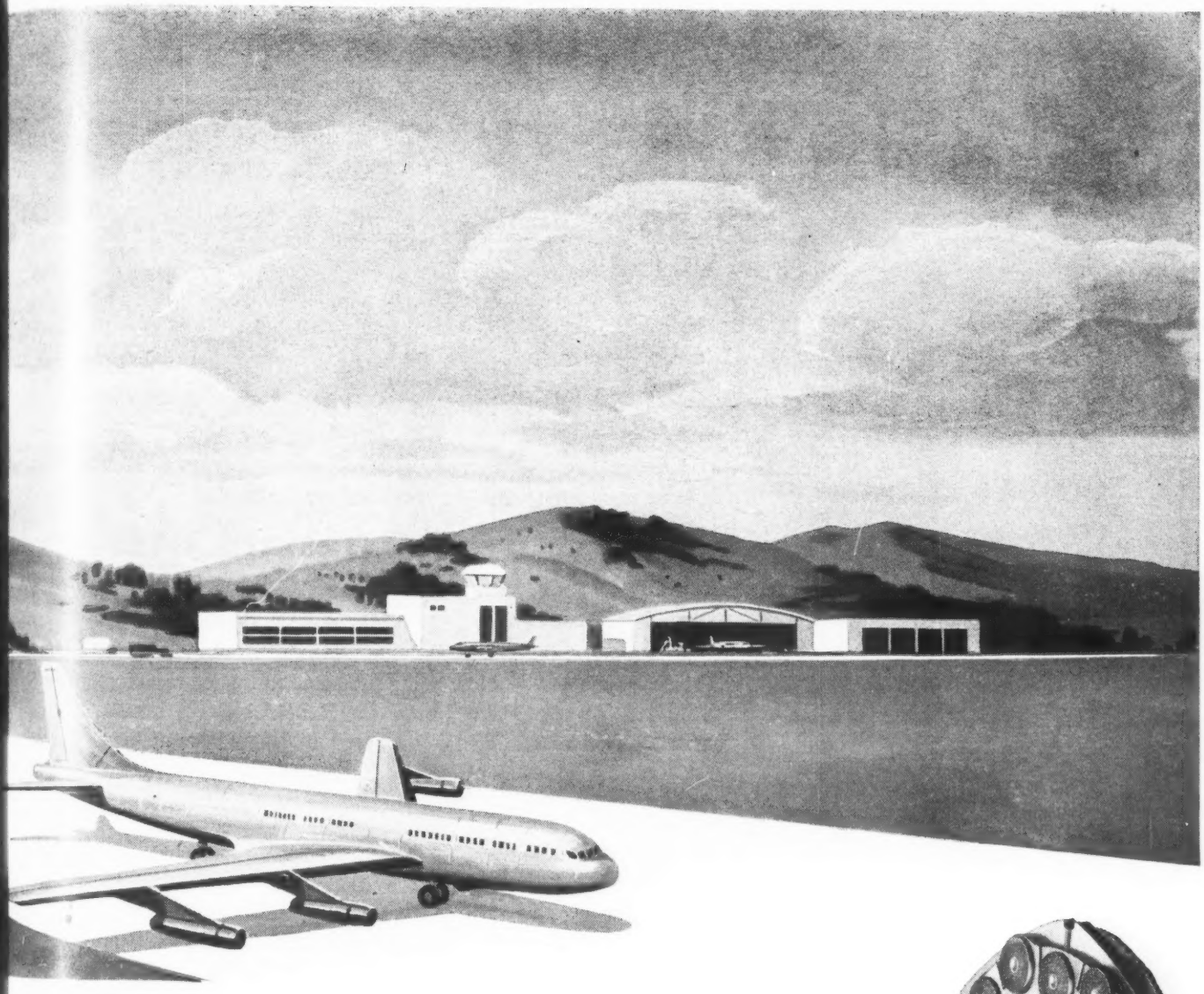

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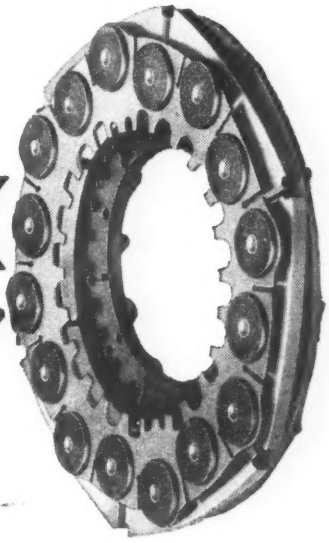

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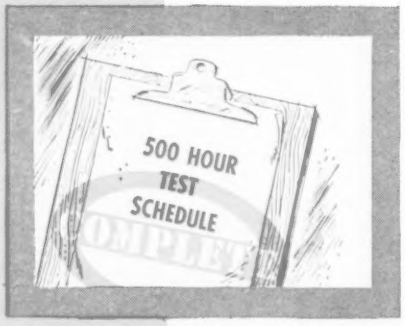

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AIR FORCE
JUNE 1956

IS THERE A DEFENSE AGAINST THE ICBM?

By T. F. Walkowicz

Given enough time and money, the answer could be yes—but do we have enough of either?

THE AGE-OLD problem of defense consists of: *detection, interception,* and *kill.* The current race between the United States and the Soviet Union for the Intercontinental Ballistic Missile has focused new attention on these three component parts of the defense problem, as they pertain to the possibility of stopping an ICBM attack against this country.

The ICBM defense problem is being discussed primarily from two points of view. The first is that of the present Administration, which has been charged with letting our ICBM program lag in a bureaucratic maze in Washington. The Administration is working hard to make up for lost time and, hopefully, to win the ICBM race. Simultaneously, research work on an ICBM defense system is apparently going forward, in the hope that even this seemingly impossible task will become "do-able" in the light of new discoveries.

An ICBM defense, if providentially it turned up in time, would help counter any adverse reaction accompanying public disclosure, *e.g.,* by the Soviets themselves, that the USSR is ahead of us with the ICBM should this be so.

The other point of view, held by those who believe that "*the* strongest offense is *the* best defense," is that it is dangerous to pin too much hope on the premise that an effective ICBM defense system, covering the entire US, will ever become operational and economically practicable. Furthermore, say those who hold this point of view, although ICBM defense R&D programs should definitely be pursued, these also are lagging, along with defense R&D programs in general.

In an atmosphere of charge-and-countercharge, with the important facts highly classified, the American taxpayer stands hopelessly bewildered. Therefore, without recourse to classified information, and utilizing considerations that follow directly from basic physics, it might be well to take a look at the ICBM defense problem. This can be done by trying to erect a theoretical ICBM defense system that, theoretically at least, might have some chance of working successfully.

DETECTION

The best detection system would let us know where Soviet ICBM launching sites are located so that we could watch them. Whether these sites are fixed or mobile, constant surveillance of them would be the best "distant early warning" for alerting in time our theoretical ICBM defense system.

There are two possibilities for providing this kind of distant early warning.

First, if the Soviets should accept President Eisenhower's mutual aerial surveillance proposal, coupled with limited ground inspection, constant observation of Soviet ICBM activities would become possible. Precisely for this reason, as recent disarmament talks in London seem to indicate, it is highly unlikely that the Reds will voluntarily accept mutual aerial surveillance until they have operational ICBM emplacements in adequate numbers well concealed in the Soviet heartland. This will be particularly true if, as many believe, the Soviets are now ahead of us in the ICBM race.

The second approach to constant aerial surveillance lies in our realization that such surveillance is rapidly becoming vital to our survival. Such realization would have to be

(Continued on following page)

followed by a *National Policy decision* to build and *operate without Soviet permission*, on a high-priority basis, aircraft and other vehicles which are able to do the surveillance job, and are also relatively invulnerable to enemy interception. Such aircraft might, for example, be nuclear-powered, so as to possess both the required endurance and the capability of out-running and out-fighting, if necessary, any Soviet interceptors which try to interfere with their mission.

With regard to the *National Policy decision*, the country has probably not been well-enough informed—authoritatively—to back the Administration in the kind of courageous action which the present Chief Executive is fully capable of taking. Regarding the air vehicles needed for the "unilateral" aerial surveillance job, it is highly improbable that their development is going forward at a pace consistent with the operational need, in the absence of the basic policy decisions and in the light of current limitations on the R&D budget.

Consider now the problem of last-ditch detection: *i.e.*, in the ICBM combat zone—*the air space over Continental North America*. Present radar is not adequate, because its range of some 300 miles would give the defense system only some two minutes to react. Thus, high-power radar of much longer range is needed. But that is not all.

One can assume that a Soviet ICBM headed for the US would be accompanied by more than a few decoys. These decoys are extremely easy to provide, for example, by detonating the ICBM booster rocket motor in space and letting its fragments—scattered over thousands of square miles—fly along with the warhead toward the target. Then, too, very high-power radar might be "spoofed," by Soviet jamming, meteors, Aurora Borealis, sun spots, perhaps even by radar reflections from the moon.

Thus, after we first invent a last-ditch radar which can see out to a range of a thousand miles or more, this radar may well see thousands of "blips," rather than just one. Button, button, who's got the button? Which "blip," out of the thousands which can be seen, represents five to twenty megatons' worth of McCoy, headed for this country?

A system for distant early warning of approaching ICBMs would be of some importance. If our radar net reached beyond the North Pole, perhaps half-way to the Soviet ICBM launching sites, we might have as much as twenty minutes' warning. This would give our retaliatory air forces time to fire their ICBMs, and to send all bombers that were airborne, and carrying H-bombs at the time, en route to the Soviet Union; it would also give all Americans time for a final prayer.

Such a warning system conceivably could be invented and built. However, with the "DEW line" against conventional bombers just going in now, it is only realistic to expect that a similar line against ICBMs will not be ready until long after the Soviets have the ICBMs.

Conclusion, for the time being, on Detection—STRIKE ONE!

INTERCEPTION

For purposes of argument, assume now that several technological break-throughs have been made, that substantially more money for R&D has been budgeted, and that a suitable anti-ICBM detection system has been discovered and developed. We must now try to intercept the ICBM warhead, hurtling toward us at roughly 10,000 miles per hour.

Note that, like all man-made devices, the detection equipment is not perfect. If it should detect the missile at about 1,000 miles range, it does so with an error, let us say, of perhaps one percent, or about ten miles. This detection information is rapidly fed into a quick-acting electronic computing and data processing system similar to SAGE (still to be operationally-proven for use in the "simple" case of air defense against manned bombers). We assume that the computer doesn't burn out a tube or make a single false computation, and that it quickly lights the fuse of an anti-ICBM missile (still to be invented).

The anti-ICBM missile accelerates rapidly and heads off to intercept the trajectory which the radar thinks it "sees" the attacking ICBM following. Here the anti-ICBM weapon designer encounters a real dilemma: if he can only get within ten miles or so of the approaching ICBM warhead, his own warhead must have a tremendously big radius of destruction. This means a hydrogen warhead. However, since anti-ICBM missiles may have to be fired in large numbers—somewhat like artillery—if the defense system is to be really effective, the designer must strive to minimize the "bang" required in his defensive missile warhead. This he must do in his own self-interest; to minimize expenditure of fusion materials, and to minimize the world-wide deleterious effects of the radioactive particles produced by H-bomb "bangs" in really large numbers.

If the defense designer wants to use a "baby" H-bomb, *i.e.*, something just big enough to knock out only Manhattan, instead of Greater New York City, he has somehow got to get his anti-ICBM missile much closer to its target. He might try to do so by installing a radar, guidance, and rocket propulsion system in the very warhead of the anti-ICBM missile itself! This may eventually be done, but it will be no mean feat.

Or, the designer might solve the accuracy problem by letting the attacking ICBM come much closer, giving his radar longer to "look" at it and locate it more accurately—and, incidentally, moving the battle zone from the polar wastes of northern Canada to, say, twenty to fifty miles above US cities. This, in turn, raises the question of what happens to those areas of the US over which an anti-ICBM missile explodes its warhead or makes its "kill" at too low an altitude.

Conclusion, for the time being, on Interception—STRIKE TWO!

KILL

Let us now assume that all inventions heretofore required have been made, and the required "defense system hardware" perfected: every attacking ICBM can now be detected and intercepted. There remains only the relatively minor problem of "killing" a few tons of metal, which is capable of taking the several "Gs" of acceleration it undergoes during launching, and built to withstand the thousands of degrees of heat which it experiences during reentry into the atmosphere.

"Kill" may, in fact, prove to be the simplest part of the problem.

First, the good Lord may provide a shower of meteors at just the right place and the right time.

Second, by firing *very many* anti-ICBM missiles which carry warheads that detonate into large numbers of very small fragments, we can literally suspend a large quantity

of such fragments in the pathway of the approaching ICBMs.

Either the good Lord's meteors or our defensive fragments might well pith the ICBM warheads, spoil the carefully designed airflow over them, and cause them to burn up as they re-enter our still-free atmosphere.

Third, by using anti-ICBMs with H-bomb warheads in *large numbers*, we might stop even a few hundred attacking ICBMs, and then undergo the rather new experience of seeing our enemy as well as ourselves very slowly becoming something else—ostriches would be most appropriate—as the mutations induced by radioactive particles begin to take place among the generations to follow us.

Conclusion, for the time being, on "Kill"—STRIKE THREE!

Should we give up seeking an anti-ICBM defense? Certainly not! For the pessimism which characterizes the outlook for finding a practicable solution to this problem today, as portrayed above, springs only from the state of today's knowledge. Who knows what tomorrow's discoveries may bring, even in these austere days when the country so obviously cannot afford to spend the R&D dollars which constitute its survival insurance.

However, even though a solution to the anti-ICBM defense problem may eventually be found, let's take a brief look at two additional aspects of the problem: the *economics* and probable *timing* of ICBM defense.

Regarding economics, suppose the Reds have built some 500 operational ICBMs. Probable cost, excluding R&D: $250 million, much less in terms of rubles paid to slave labor.

Let us now try to construct and operate an anti-ICBM defense system, keeping in mind that it must maintain the most merciless twenty-four-hour alert that has ever been seen. Let us also note that every part of this defense system must be capable of handling the greater part of those 500 Red ICBMs on their way to this country, in one big volley.

Remember, for example, that the Soviets might explode many of the their ICBMs over the Western part of the US, when the winds would carry the fallout over much of the country. Another large volley might be aimed just off the Atlantic Coast, and the soothing waters of the ocean, now radio-actively hot and churned into monstrous waves, might be sent on their way to caress the relaxed swimmers at Coney Island, Atlantic City, Sea Island, and Miami.

So, the anti-ICBM system must be capable of taking a hell-making volley aimed at any one area, rather than being designed just to cope with the relatively easy job of several dozen "ICBM buckshot" heading individually for various parts of the country.

The probable cost of a still-to-be-invented anti-ICBM system which could take on this defensive job will surely run in the tens of billions of dollars. In other words, modern weapons, such as the ICBM with H-bomb warhead, are drastically reducing the cost of *strategic attack* and, simultaneously, raising the cost of *defense* to astronomical proportions.

Regarding timing, one can simply gather from various official statements that an ICBM defense system will certainly not be available until some considerable time—perhaps several years—after the Soviets possess an ICBM capability.

In the light of the above, we must squarely face up to the implications of the following major conclusions:

- Distant Early Warning of impending or on-coming ICBM attack would be of great importance, and should be actively pursued. By giving us *time* to retaliate, such warning of itself becomes a very important deterrent.
- ICBM defense of great areas, if it ever becomes *technically* feasible, may well prove *economically* impracticable.
- ICBM defense of "strong points" of major importance, *e.g.*, our own retaliatory capability, if it ever becomes technically and economically practicable, may not be available until some time *after* the Soviets possess an ICBM capability.

Thus, we face the advent of an era of great instability in world affairs. Should one nation achieve an appreciable operational ICBM capability first, the temptation will become extremely great to "seek a showdown," *i.e.*, to strike first.

Therefore, unless we stay *unquestionably* ahead of the Soviets in "conventional" deterrent-retaliatory airpower and achieve the ICBM first, this will be an era of great danger for the free world. For it appears certain that US retaliatory strength will never be used "to retaliate first." But who can say with firm assurance that international Communism, a form of amoral insanity ruled by a volatile dictatorship, shall never commit an insane act of aggression?

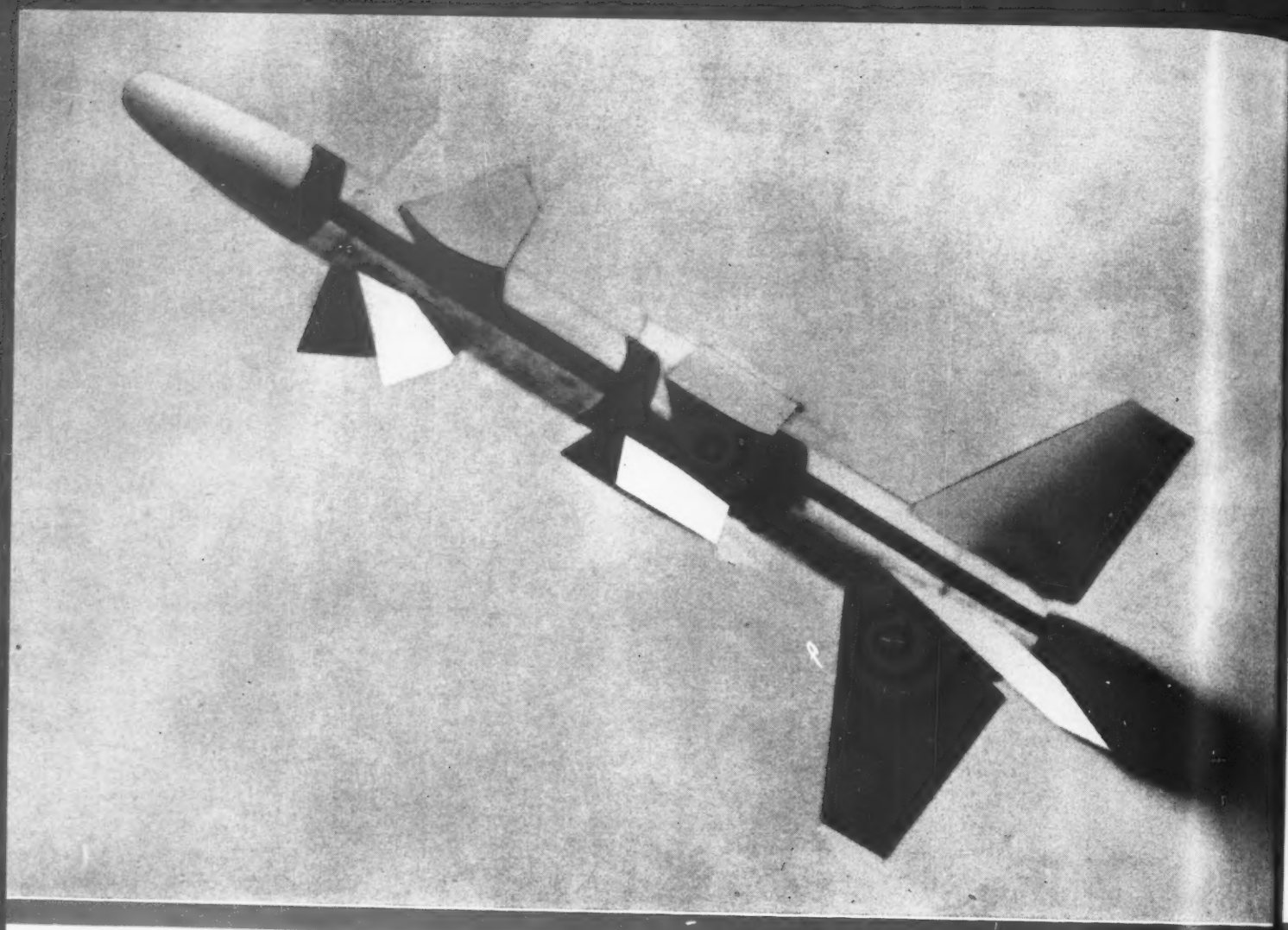
Unfortunately, this appears to be an unpopular time to expect people to face up to unpleasant eventualities. On the one hand, we are seriously asked to accept the "terrible finality" of the Communist enslavement of millions of once-free people—but we seem unable to comprehend that, historically, a nation which condones injustice for others, eventually meets injustice itself.

On the other hand, we are told, in effect, that balancing the budget is more important than maintaining that wide margin of strength required to deter war without any question, *i.e.*, without running the risk of Soviet miscalculation. The Administration is certainly not saying this in so many words—but how else can one interpret the dangerous notion being subtly put forward that we can deter World War III with less airpower than would be required to gain air ascendancy *rapidly* in that war, if it should be visited upon us?

It must take tremendous courage to take the kind of calculated risks with national security which our current airpower programs represent. No matter how strongly some have taken issue with the judgment of the Administration on this score, nobody has questioned the high motives of its officials, or brushed these officials aside as "dedicated specialists" in balancing the budget. Yet, those who would prefer to be "free men in the poor house," rather than the "richest men in the graveyard," have been labelled "fear-mongers," and the judgment of professionals in the art of survival through deterrence is being lightly brushed aside.

Somehow, as a Nation, we seem to be losing sight of the fact that freedom is a *priceless* commodity, which will be lost if we are not fully prepared to fight for it. The word "Concord," once synonymous with the embattled farmers' fight for freedom, is rapidly becoming a symbol only of grapes, *i.e.*, the election year *sour* grapes of those who are annoyed because some Americans refuse to rely on the mere hope that the Soviets won't strike us, but prefer instead to rely on the deterrence of our formerly clear-cut air superiority.

Unfortunately, history will not stand still for an election year. And, as that history is one day being written, may it find it possible to be kind to those who brushed aside a realistic assessment of mounting peril, and embraced instead the purveying of the kind of unjustifiably hopeful complacency which is the first hallmark of a great Nation on the way to its grave.—END



The Talos missile—developed by the Navy and planned for use by the AF. It has a much longer range than the Nike.

THE ARMY'S BIRD IN HAND

An AIR FORCE Magazine Staff Study

RISING defense costs coupled with the pressures of an election year are bound to result in close Congressional scrutiny of our military programs. In the past, such investigations have turned up some rather startling evidence that all of our defense money doesn't go into fighting strength. This year should be no exception. One of the skeletons now beginning to rattle in the military closet is a weapon development that has profited from one of the most terrific publicity build-ups in recent history—the Army's Nike.

As this issue went to press, Sen. John Stennis, (D., Miss.), a member of the Senate Appropriations committee, proposed that there be no more big money spent on the Nike missile until it had undergone "more modern and more practical tests" than it had received to date. Nike, an Army surface-to-air anti-aircraft missile, should be pretty well known in view of the wide publicity it has received. For weeks it flashed on TV screens all over the country, and pictures of it showed up in newspapers and magazines. The favorite shot was one that saw the Nike shattering a war-weary B-17. One Air Force veteran of World War II remarked that the Nike had shot down more B-17s than the Nazis had been able to.

In the same session, Senator Stennis also threw a block into the Talos missile. Talos is a newer air defense missile developed by the Navy and planned for use by the Air Force. It is a much longer range weapon than the present Nike, and incorporates other new features.

Talos is still in the development stage, but it is scheduled to go into production soon, and funds for Talos units are contained in the Air Force budget now being considered on Capitol Hill.

The Army quickly reacted against Senator Stennis's proposal. Secretary of the Army Brucker contended that Nike "is able to bat down any Russian bomber in existence or heard about." He also said that an improved model, known as Nike-B, is now under development. (This would put Nike-B in about the same time range as the Air Force's Navy-developed Talos.) Secretary Brucker said that this new model would have greater altitude and speed than the present versions. Today's Nike is a 1,600-mile-an-hour rocket with a range of something between twenty-five and fifty miles.

The Air Force, after a hard look at the performance of jet bombers now rolling off Soviet production lines, is not so sure that Nike would be a match for them.

Despite the doubts of the service charged with the air defense mission, the Army has been particularly voluble in its claims, and Secretary Brucker has been a strong proponent. He has called Nike a "deadly missile which can reach, outmaneuver, and destroy any aircraft either available at the present time or under development now." Lt. Gen. James M. Gavin, scholarly combat veteran and head of the Army research and development program, has reiterated these claims, saying that the Nike system "can destroy any airplane or planned airplane regardless of great heights or speeds." And Lt. Gen. Stanley R. Mickelsen, commander of Army anti-aircraft units, really went out on the limb when asked recently if Nike could adequately defend against a guided missile attack. His answer was an unequivocable "Yes." Said General Mickelsen, "Nike is capable of killing any known guided missile and will be effective against the intercontinental ballistic missile when it materializes" (*see page 39*).

If this were so, the Continental Air Defense Command's General Partridge and his staff, and all of the fighter pilots sitting on runways all over the nation could take off their hard hats and go home. If they did, however, the job of the Russian air planners would become immeasurably easier. Few military leaders will agree that you can erect a perfect defense. The Air Force doesn't claim to be able to do it with its interceptor aircraft, even though these have the advantage of meeting the enemy before he reaches our borders and of fighting him all the way to the target. It is axiomatic that the longer an enemy plane is exposed to attack, the better the chances are of knocking him out of the skies. To say that a last-ditch weapon—one that doesn't get into action until enemy bombers are approaching the bomb release line—is an effective air defense system seems a little less than realistic.

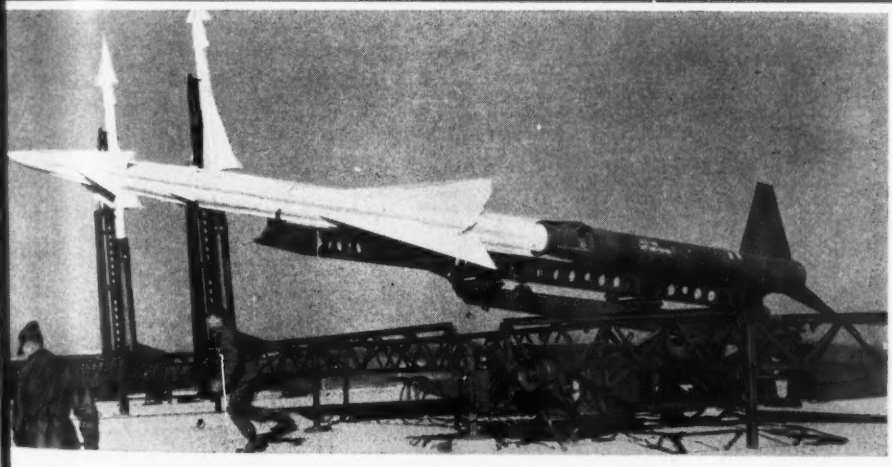
Obviously, the real test of any air defense weapon would be an enemy attack, if it ever comes. That's a little too late to take corrective measures. Short of that unhappy prospect, however, there are ways to get some measure of the effectiveness of air defense weapons. We can create conditions that at least simulate the main problems of a real attack.

If the Army could come forward with testimony that this has been done—successfully—the nation could rest easier, but many people, apparently including Senator Stennis, are satisfied that this has never been done. Air Force pilots who fly jet bombers and fighters hundreds of knots faster than the Army's favorite target—the B-17—are particularly scornful of Nike's capabilities.

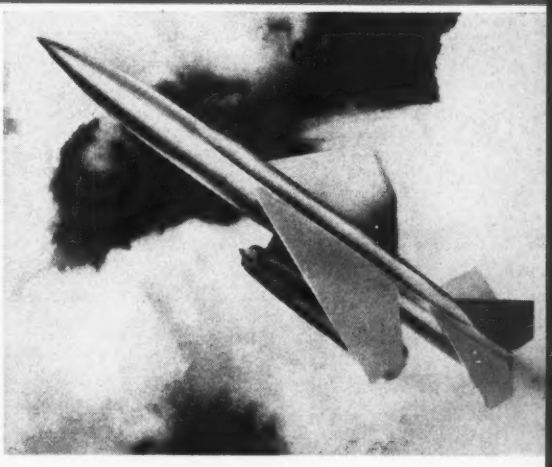
This Air Force disdain could be written off as "flyboy stuff" if it were not for the disclosure of the results of some Nike firings.

These reports of tests held at White Sands, N. Mex., appeared to indicate that the Nike rocket is pretty much of a fizzle—capable of exploding little but the claims of its effectiveness.

Official releases on these test runs, which began last fall, were sketchy. But this much is known—against a subsonic, medium-altitude, Air Force Matador (an unmanned tactical bomber in the 500-mph range) the Nike chalked up many more misses than hits. Unofficial reports stated that the Matador flew a prearranged course and used neither evasive action nor countermeasures.



The Army's Nike. The AF doubts that it would be a match for Red jet bombers.



IM-99 "Bomarc" pilotless interceptor.

While there have been no official statements to confirm these reports, there likewise have been no official denials from Army spokesmen, who in the past have been quick to rebut any criticism of their pet weapon. In fact, since mid-December there has been a big drop in the volume of Army talk about Nike's effectiveness—at least until they were challenged on Capitol Hill.

Emphasis has now shifted. The technical extravaganza acclaiming today's Nike has faded, like a Hollywood starlet who has great superficial charm and a battery of press agents, but whose first appearance in a costly production has been an obvious flop.

Now a new starlet appears on the scene—Nike-B—and with it a new flood of claims. Congress has been told

(Continued on following page)

that this missile is a "new, superior, supersonic weapon of the Nike type," capable of destroying an entire flight of planes, rather than just one. It is touted as able to "effectively predetonate atom-bomb carriers outside of the danger zone." These comments are especially interesting, in light of previous talk. For they would seem to admit that today's Nike system is capable of engaging only one airplane at a time, and, more important, won't be able to hit enemy bombers until they are already in the "danger zone."

This is exactly what many of Nike's critics have been saying. Even if Nike units could hit everything they aimed at, it is still a "one-at-a-time" defense system at a time when Russian bombers number in the thousands. And Nike can't reach out and knock down a bomber until he is almost on top of his target. Under such conditions, it would be of little consequence to shoot down a bomber if the destruction it carried crashed in, or near, the target area.

There is another angle that hasn't been discussed, except in theory. Nike must be command-guided all the way, by radar on the ground. Hence, it must be extremely vulnerable to the ingenious countermeasures designed to confuse the electronic minds of command guidance systems. One way to overcome this is to build a target-seeking mechanism into the missile itself. Then all you have to do is get the weapon into the vicinity of the target where its own electronic devices take over and guide it home. New missiles that are coming along will have these seeker aids, thereby relieving them of the dependence on radar, which is particularly vulnerable to countermeasures. There is good reason to doubt that the Nike family can be modified enough to incorporate this new gadget without getting into a project that would amount to developing a completely new missile. Thus, Nike's future as an effective air defense weapon looks pretty gloomy.

All of this raises the question of how we got into such a fix—how did this skeleton get into the closet in the first place? Well, it's something like the song "Dry Bones,"—"the foot bone's connected to the ankle bone, the ankle bone's connected to the leg bone," etc. The Army stuck a foot bone into the door of the air defense mission and in a short time got in all the way.

The Army has been shrinking in size since the close of the Korean war. To offset this, it is jealously guarding traditional functions while striking out boldly in a search for new weapons that could get them into new functions. It was inevitable that the Army would latch on to air defense as one means of getting back into the act in a starring role. In short, it wants to take over all missile defenses and thereby wind up with an honest-to-goodness air defense mission.

Several months ago a news story in the Washington *Post and Times Herald* stated: "The Army Chiefs launched a strong protest yesterday against Air Force plans to set up Talos guided missile bases as part of the anti-aircraft defense of the US. During a three-hour session with Secretary Wilson, Secretary Brucker and General Taylor are reliably reported to have branded such a move as a wasteful duplication of the Army's own Nike missile system and an invasion of an approved Army mission."

When Army Chief of Staff Gen. Maxwell Taylor appeared before the Senate last month he put the official stamp of approval on this report.

General Taylor minced no words. In answer to a question before the Senate Appropriations committee, he said he regarded the Air Force plans for the Talos missile as "an invasion of the Army's anti-aircraft mission." It is obvious that the dispute goes deeper than Nike and Talos. Both are only forerunners of the tremendous air defense missile family of the future.

So when General Taylor talks about the Air Force invading Army territory, he is really putting forth the Army views and interpretations of the air defense roles and missions. Like most service disputes, it's a matter of interpretation—it's all in the way you read the Key West Agreement.

Here's what the Key West records have to say about air defense roles and missions. The Air Force is given this primary *function*: "To be responsible for the defense of the United States against air attack." The document goes on to define air defense as "all measures designed to nullify or reduce the effectiveness of an attack by hostile aircraft or guided missiles after they are airborne."

This seems clear enough. What then is this invasion that General Taylor talks about? It would appear to be the following: The Key West Agreement also lists this as a primary Army function: "to organize, train and equip Army anti-aircraft artillery units." Obviously, this is the basis for the Army position in this dispute. Conceivably this proviso could also be a basis for the Navy to get into the fracas because it too has an assigned responsibility for providing *forces* for air defense. In fact, so does the Air Force. All three services have responsibilities for providing *forces* for the air defense task. But the point is that only the Air Force has air defense as a *mission*.

The employment of all these forces and weapons falls within the air defense mission of the Air Force. The Air Force is further responsible for establishing doctrine and procedures governing the *use* of anti-aircraft in air defense.

If either the Defense Department or the Joint Chiefs of Staff have ever agreed with the Army's contention that it is responsible for anti-aircraft defense, the matter has never been one of public record. Rather, there are indications that decisions at these levels have gone the other way. There has been no announced change in the Air Force function of developing, in coordination with the other services, doctrines, procedures, and equipment for air defense of land areas, including the continental United States. The national decision to establish the Continental Air Defense Command, with the Air Force as executive agent, is further confirmation of this Air Force responsibility.

Thus, the way we got into this fix becomes clear. The Army started with its anti-aircraft artillery units and expanded this into the Nike system. Now forgotten is the original justification for the Nike development, which was to meet an Army requirement for defense of troops in the field. Once developed, Nike has been employed almost exclusively as a continental air defense weapon. It is significant that it is even now ringed around cities and other vital installations—not troops in the field. In fact, many of Nike's limitations stem from the fact that it was not designed for the use to which it is being put. Yet, there is no denying that the Army does have a missile force in being. Nike units are in existence and are deployed around our cities. The Army has parlayed this capability into a tool with which to pry its way into the air defense mission and eventually attempt to take over all surface-to-air missiles.

Last month we outlined the Army's tacit acknowledgement of airpower as the prime instrument of national military policy and pointed out some of its efforts to get

(Continued on page 88)

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Air Defense Command

Mission: 'Defend the US Against Air Attack'

★ ★ ★ ★ ★ ★ ★ ★

The past two issues of AIR FORCE have been devoted to the Strategic Air Command (April) and the Tactical Air Command (May). This month we salute the command which will be charged with the awesome responsibility of protecting our nation from a death blow if a major war should start—the Air Defense Command.

The man on whose shoulders this responsibility rests is Gen. Earle E. Partridge, and he directs ADC's far-flung operations from his headquarters at Ent AFB, Colorado Springs, Colo. General Partridge wears two hats at the moment—the other as commander of the Continental Air Defense Command, a vast command encompassing units of the Air Force, the Air National Guard, the Coast Guard, the Navy, and the Ground Observer Corps. The story of how ADC and ConAD have contributed—and continue to contribute—to a "Decade of Security Through Airpower," is told on the following pages.

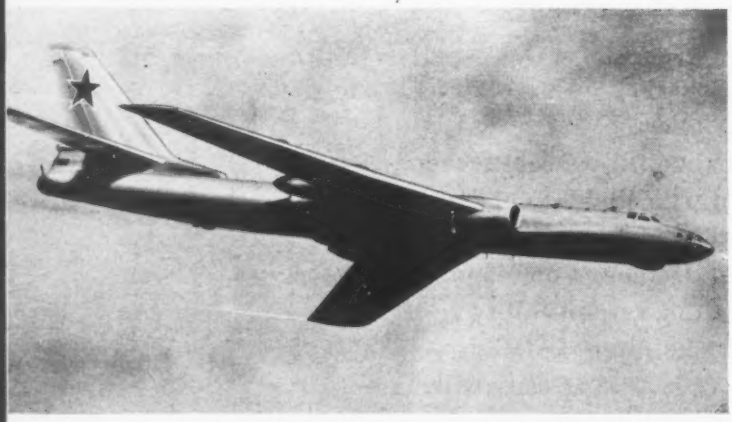
—THE EDITORS

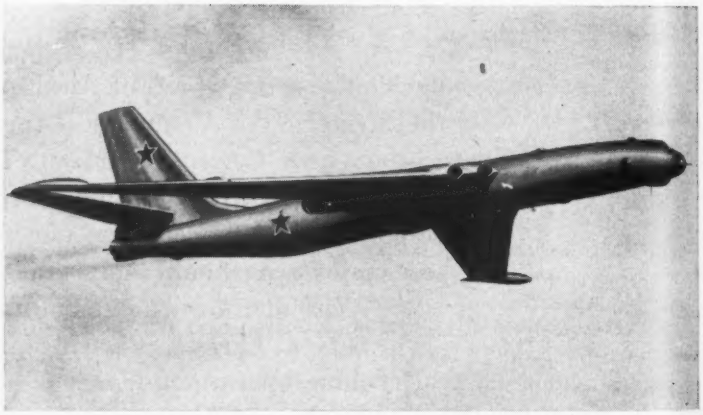
ConAD Commander Gen. Earle E. Partridge (center) shown with Rear Adm. Hugh H. Goodwin (left), who is head of naval forces at ConAD and Lt. Gen. Stanley R. Mickelsen, ConAD's Army Anti-Aircraft chief.

How the Air Defense Command builds

A Wall Twelve Miles High

By Ed Mack Miller





The existence of these two giant Russian jet bombers makes the job of the Air Defense Command the more urgent. On the left, T-39 Badger, counterpart of our B-47 Stratojet. At right, T-37 Bison, on a par with our B-52 Stratofort.

THE mission of the nation's youngest military organization, the Continental Air Defense Command, is stated in a simple seven-word sentence: "Defend the United States Against Air Attack." But behind those seven words is one of the toughest jobs ever attempted by man. The Air Defense people must build and maintain around America a wall 10,000 miles long and twelve miles high. And in the No-Man's-Land in front of the wall, they must maintain enough upper air trip-wires, booby-traps, and dead-falls to discourage any enemy attack. Behind the wall, too, they must build the final defenses to pick off any determined aerial invaders who might make their way through.

The menace is massive. The Russian bear is now capable of flipping a lethal paw in the face of America. Its striking force, known to US airmen as SUSAC (Soviet Union Strategic Air Command) and to Russians as ADD (*Aviatsiya Delnevo Deystviya*), now has several thousand heavy bombers stationed at newly built bases in the Soviet Arctic, only a few hours flying time from the US. Their pilots are well trained—even in instrument flying. Their best bombers—the T-37 Bison and the T-39 Badger—are pure jet and can carry the hydrogen bomb.

Trying to defend a continent as vast as ours without knowing where or when the enemy will strike is, as one ADC man says, "like trying to stop a snowstorm with a barbed-wire fence." But it has to be done.

The nerve center of our defense system is the Continental Air Defense Command (ConAD), with headquarters at Ent Air Force Base in Colorado Springs, Colo. Ent is the hub of a defensive network stretching north to installations well above the Arctic Circle and from east to west far beyond the edges of the continent.

The Air Force has the prime responsibility for air defense and is the

executive agency of the Department of Defense for the continental air defense system. The Air Force furnishes interceptor and airborne early warning forces and the basic ground network for surveillance of the air and control of all weapons. The Army furnishes anti-aircraft forces, and the Navy furnishes picket ships for the extension of radar coverage offshore, operates the sea flank of the early warning lines, and will furnish in time of emergency other forces which have an air defense capability.

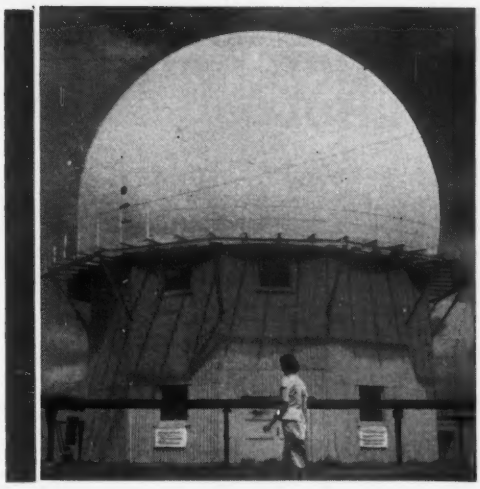
The Commander of the Continental Air Defense Command is Gen. Earle E. Partridge, who is flanked at the Colorado Springs Command post by Lt. Gen. Stanley R. Mickelsen, chief of the Army's Anti-Aircraft Command, and Rear Adm. Hugh H. Goodwin, who commands all naval and Marine forces allotted to the Air Defense mission.

General Partridge, a tall, slim fighter-pilot type, wears ten rows of battle ribbons beneath his command pilot's wings. His confreres consider him an excellent pilot and a natural to continue building ADC from where retired Gen. Benjamin W. Chidlaw left off in welding the command into a "tough-tiger outfit."

Born July 7, 1900, at Winchendon, Mass., General Partridge enlisted in the Army on July 10, 1918, and served in the Argonne offensive, France, with the 79th Division. After World War I, he studied at Norwich University, Northfield, Vt., and was appointed to the US Military Academy in 1921, and commissioned a second lieutenant of the Air Service three years later, upon his graduation.

In 1942 he was made a member of the War Department General Staff, Joint Strategic Committee. In 1943 he

(Continued on page 50)



Radar is basic to ConAD's mission, since air defense starts with detection.

Day and night, ConAD radar operators watch their scopes for unidentified aircraft.

Left—Ground Observer Corps filter centers play an important role in air defense. Below—Plotters must learn how to write in reverse.

Heart of the Combat Operations Center is the main plotting board, mounted on a piece of plexiglass measuring 20 x 30 feet. An outline map of the US, Canada, and portions of the polar regions are etched on the board.

THE AIR DEFENSE COMMAND

Hq., Air Defense Command
Ent AFB, Colo.

1
Commander
Gen. Earle E. Partridge

2
Vice Commander
Lt. Gen. Roger M. Ramey

3
Inspector General
Col. Joel E. Mallory

4
Judge Advocate
Col. William S. Dolan

5
Chief of Staff
Maj. Gen. George F. Smith
(Will be reassigned July 27, 1956)

6
Director, Information Services
Col. Barney Oldfield

7
Surgeon
Brig. Gen.
Albert H. Schwichtenberg

8
Chaplain
Col. William W. Sissel

Adjutant General
Col. Walter W. Robinson

9

10
DCS/Comptroller
Brig. Gen. Robert S. Macrum
(Will be reassigned July 1, 1956)

11
DCS/Personnel
Brig. Gen. John C. Horton

12
DCS/Operations
Maj. Gen. Hugh A. Parker

13
DCS/Intelligence
Brig. Gen. Robert Taylor, III

14
DCS/Materiel
Maj. Gen. Marshall S. Roth

15
Commander
Maj. Gen. Norris B. Harbold

27
Commander
Maj. Gen. Jarred V. Crai

39
Commander
Maj. Gen. Roy H. Lynn

An **AIR FORCE** Magazine photochart
(Corrected as of May 15, 1956)

Hq., Eastern Air Defense Force
Stewart AFB, N.Y.

16 **Vice Commander**
Brig. Gen. James W. McCauley

17 **Adjutant**
Col. John L. Warren

18 **Inspector General**
Col. Hanlon H. Van Auken

19 **Judge Advocate**
Col. Gaetano V. Strati

20 **Chief, Information Services**
Col. Joseph B. McShane

21 **Surgeon**
Col. Charles C. Scamahorn

22 **Comptroller**
Col. William C. Warren

23 **Deputy for Personnel**
Col. John B. Gaffney

24 **Deputy for Operations**
Brig. Gen. Arthur C. Agan, Jr.

25 **Deputy for Materiel**
Col. Glenn C. Thompson

26 **Deputy for Intelligence**
Col. Aram S. Tootelian

Hq., Central Air Defense Force
Grandview AFB, Mo.

28 **Vice Commander**
Brig. Gen. Edward W. Suarez

29 **Adjutant**
Lt. Col. David R. Toole

30 **Inspector General**
Col. Frederick A. Pillet

31 **Judge Advocate**
Col. Jerome L. Loewenberg

32 **Chief, Information Services**
Col. James T. Sheridan

33 **Surgeon**
Col. Ralph E. Switzer

34 **Comptroller**
Col. Duward L. Crow

35 **Deputy for Personnel**
Col. John A. Carey

36 **Deputy for Operations**
Col. Gordon H. Austin

37 **Deputy for Intelligence**
Col. George D. Hastings

38 **Deputy for Materiel**
Col. Charles Dimmock

Hq., Western Air Defense Force
Hamilton AFB, Calif.

40 **Vice Commander**
Brig. Gen. Edwin L. Tucker

41 **Adjutant**
Lt. Col. Albert D. Fallows

42 **Inspector General**
Col. Philip C. Loofbourrow

43 **Judge Advocate**
Col. Milton Goldinger

44 **Chief, Information Services**
Lt. Col. Philip D. Wachtel, Jr.

45 **Surgeon**
Col. Robert S. Brua

Hq., Eighth Air Division
McClellan AFB, Calif.

51 **Commander**
Brig. Gen. Kenneth H. Gibson

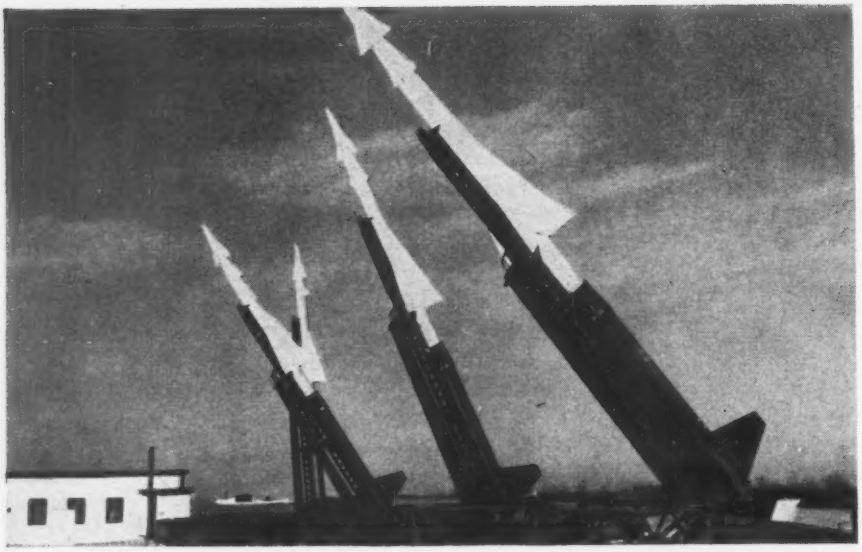
46 **Comptroller**
Col. Harry F. Cruver

47 **Deputy for Personnel**
Col. James H. Bearly

48 **Deputy for Operations**
Col. Clayton B. Claassen

49 **Deputy for Materiel**
Col. Orin M. Bixby

50 **Deputy for Intelligence**
Col. Robert B. Sullivan



When ConAD was formed in 1954, Army units—such as these Nike missile batteries—and Navy units joined with the Air Force to form one defense command.

became Chief of Staff of the Twelfth Bomber Command and later Deputy Commander of the Fifteenth Air Force. Moved to England in 1944, he became Deputy Commander of the Eighth Air Force and the following June assumed command of the Third Bombardment Division. Returning to Air Force Headquarters in 1946, he became Assistant Chief of Staff for Operations.

He took the Fifth Air Force to Korea in 1950 as Commander, and in 1951 was designated Commander of the Air Research and Development Command at Baltimore. He assumed command of the Far East Air Force, with headquarters at Tokyo, Japan, in 1954, and was then designated Commander-in-Chief of the Continental Air Defense Command at Ent AFB, Colo., July 20, 1955.

The men of General Partridge's battle staff guard America from a windowless, block-constructed building in the shadow of Pike's Peak. The heart of the Combat Operations Center is the main plotting board, mounted on a piece of plexiglass measuring twenty by thirty feet (one of the largest single pieces of plexiglass in the world). Etched on this board is an outline map of the US, Canada, and portions of the polar regions. The mission of the Combat Operations Center is to detect an air attack and to notify all military and Civil Defense units instanter. On the basis of information being received around the clock from radar sites and Ground Observer Corps filter centers, tracks of unidentified aircraft are plotted on the board on three different levels above the main floor. Probably the most interesting piece of equipment in the dramatic "Ops Center" is the bright red telephone which sits on the ConAD Commander's desk.

The red telephone (the "panic line" to ADC units) is a symbol of the net of direct-communication lines that fan out from Colorado Springs all over America to windswept radar sites, to regional filter centers of the Ground Observer Corps, to fighter-interceptor "scramble shacks," to any of thousands of places across and up and down the continent where men and women wait, nerves close to the surface, ears tuned to full gain, senses sharpened, faces perhaps to the sky—waiting for a call they hope will never come.

What most Americans do not realize is that the Russians probably know the capability of our Air Defense Command better than we do. They know because day and night their ferret raids feel out North America's defenses. US jets on radar alert around the watery edge of our continent are used to scrambling for Red reconnaissance planes. The Russians' mission, of course, is to probe the radar screen, tease interceptors aloft, chart and time defense reaction.

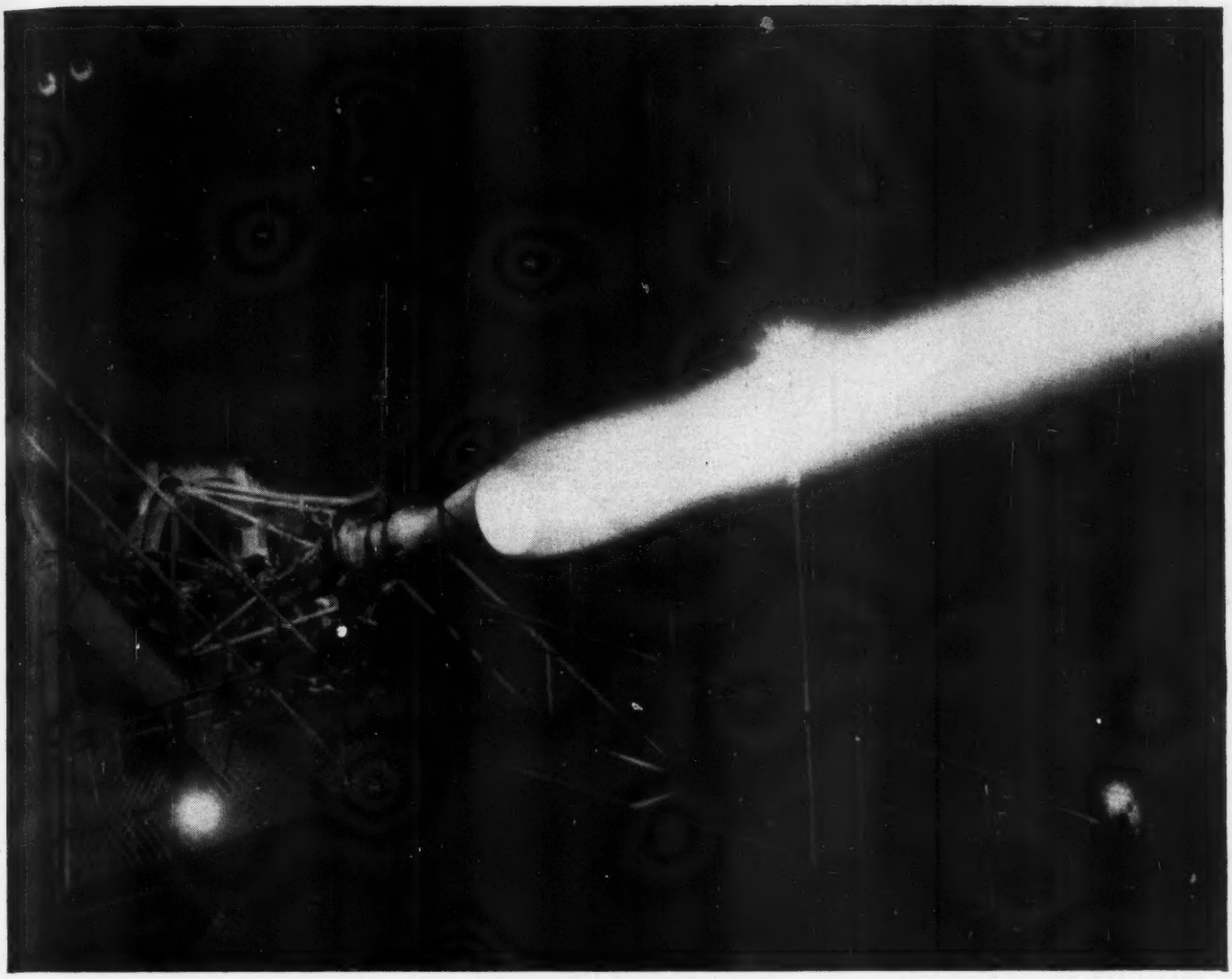
Successful air defense starts with detection. To build the wall ConAD had first to perfect an adequate warning system that would provide a detection capability extending far enough outward from the nation's borders and coastal areas to allow the necessary time for interception and air battle by fighter planes and for action by anti-aircraft forces.

Within the past decade, the defenses have grown from a few undermanned, ill-equipped radar squadrons and a handful of obsolescent fighter aircraft into a vast network of radar and civilian observer sentry posts, jet all-weather interceptor squadrons, Navy picket ships, Air Force early warning aircraft, and anti-aircraft gun and missile batteries. At the same time, the agency that has the air defense mission has been raised to a tri-service command under the Joint Chiefs of Staff.

The evolution of the Continental Air Defense Command came in five major jumps. The first was a decision by the Army Air Forces in the early part of 1946 to set up a major component to continue research into the art of air defense. Next came the agreement of the three services, after the Air Force became autonomous, that the primary responsibility for air defense should rest with the Air Force. This was followed by the creation of a temporary air defense system in 1949, and shortly thereafter, by the foundation of a permanent system of radar stations and more modern defensive weapons. The final major development has come since

(Continued on page 52)

Gen. Earle E. Partridge at the moment wears two hats—one as head of ADC, the other as ConAD's chief.



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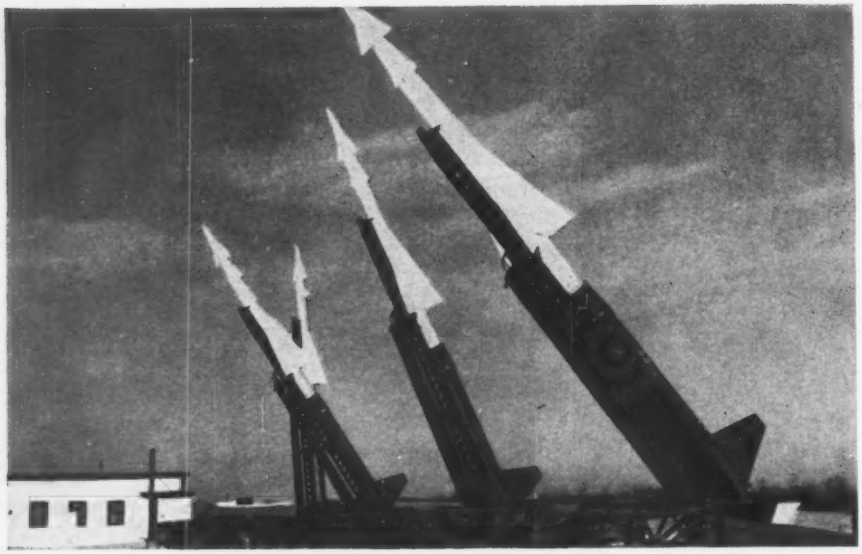
ROCKETDYNE. *A Division of North American Aviation, Inc.*

BUILDERS OF POWER FOR OUTER SPACE



When ConAD was formed in 1954, Army units—such as these Nike missile batteries—and Navy units joined with the Air Force to form one defense command.

became Chief of Staff of the Twelfth Bomber Command and later Deputy Commander of the Fifteenth Air Force. Moved to England in 1944, he became Deputy Commander of the Eighth Air Force and the following June assumed command of the Third Bombardment Division. Returning to Air Force Headquarters in 1946, he became Assistant Chief of Staff for Operations.

He took the Fifth Air Force to Korea in 1950 as Commander, and in 1951 was designated Commander of the Air Research and Development Command at Baltimore. He assumed command of the Far East Air Force, with headquarters at Tokyo, Japan, in 1954, and was then designated Commander-in-Chief of the Continental Air Defense Command at Ent AFB, Colo., July 20, 1955.

The men of General Partridge's battle staff guard America from a windowless, block-constructed building in the shadow of Pike's Peak. The heart of the Combat Operations Center is the main plotting board, mounted on a piece of plexiglass measuring twenty by thirty feet (one of the largest single pieces of plexiglass in the world). Etched on this board is an outline map of the US, Canada, and portions of the polar regions. The mission of the Combat Operations Center is to detect an air attack and to notify all military and Civil Defense units instanter. On the basis of information being received around the clock from radar sites and Ground Observer Corps filter centers, tracks of unidentified aircraft are plotted on the board on three different levels above the main floor. Probably the most interesting piece of equipment in the dramatic "Ops Center" is the bright red telephone which sits on the ConAD Commander's desk.

The red telephone (the "panic line" to ADC units) is a symbol of the net of direct-communication lines that fan out from Colorado Springs all over America to windswept radar sites, to regional filter centers of the Ground Observer Corps, to fighter-interceptor "scramble shacks," to any of thousands of places across and up and down the continent where men and women wait, nerves close to the surface, ears tuned to full gain, senses sharpened, faces perhaps to the sky—waiting for a call they hope will never come.

What most Americans do not realize is that the Russians probably know the capability of our Air Defense Command better than we do. They know because day and night their ferret raids feel out North America's defenses. US jets on radar alert around the watery edge of our continent are used to scrambling for Red reconnaissance planes. The Russians' mission, of course, is to probe the radar screen, tease interceptors aloft, chart and time defense reaction.

Successful air defense starts with detection. To build the wall ConAD had first to perfect an adequate warning system that would provide a detection capability extending far enough outward from the nation's borders and coastal areas to allow the necessary time for interception and air battle by fighter planes and for action by anti-aircraft forces.

Within the past decade, the defenses have grown from a few undermanned, ill-equipped radar squadrons and a handful of obsolescent fighter aircraft into a vast network of radar and civilian observer sentry posts, jet all-weather interceptor squadrons, Navy picket ships, Air Force early warning aircraft, and anti-aircraft gun and missile batteries. At the same time, the agency that has the air defense mission has been raised to a tri-service command under the Joint Chiefs of Staff.

The evolution of the Continental Air Defense Command came in five major jumps. The first was a decision by the Army Air Forces in the early part of 1946 to set up a major component to continue research into the art of air defense. Next came the agreement of the three services, after the Air Force became autonomous, that the primary responsibility for air defense should rest with the Air Force. This was followed by the creation of a temporary air defense system in 1949, and shortly thereafter, by the foundation of a permanent system of radar stations and more modern defensive weapons. The final major development has come since

(Continued on page 52)

Gen. Earle E. Partridge at the moment wears two hats—one as head of ADC, the other as ConAD's chief.

Security restrictions permit us to show you only this unclassified Rocketdyne engine, a forerunner of today's more powerful units.

Rocket power for intercontinental guided missiles is here

Ten years ago this degree of power did not exist . . . but the future of our nation's guided missile program demanded it.

So when the ROCKETDYNE Division of North American Aviation, Inc., was given the task of creating such engines, they had to start practically from scratch. This meant new designs – including improved cooling methods and manufacturing techniques – that permitted temperatures greater than blast-furnace heat inside the engine, yet kept the outside cool enough to touch.

Engineers studied available fuels so that engine designs could extract maximum energy from every gallon. This called for new pumps . . . and turbines to drive them. Turbines, more powerful than 10 auto engines yet smaller than a car battery, were built. The completed engines, tested at ROCKETDYNE'S propulsion field laboratory in the nearby Santa Susana Mountains, have passed the rugged requirements of space flight.

This 10 year backlog of experience in all phases of rocket engine development and manufacture has made ROCKETDYNE the leading supplier of large, liquid-propellant rocket engines to our Armed Services and the guided missile industry.

ROCKETDYNE will welcome inquiries from engineers interested in this new field. Write ROCKETDYNE, Personnel Manager, Dept. F-12, 6633 Canoga Ave., Canoga Park, California.

ROCKETDYNE. *A Division of North American Aviation, Inc.*

BUILDERS OF POWER FOR OUTER SPACE

First ADC commander—Lt. Gen. George B. Stratemeyer. Headquarters were at Mitchel AFB.

Lt. Gen. Ennis C. Whitehead. As commander of ConAC, air defense was one of his jobs.

Maj. Gen. Gordon P. Saville headed ADC when it was a unit within the structure of ConAC.

Gen. Benjamin W. Chidlaw—under his command, ADC emerged as a major Air Force command.

1954 in the giant increase in the size of the defense system, the equipping of it with newest weapons, and the elevation of it to a function of joint command.

The increasing accent on air defense does not, however, signify a "Maginot Line, head-in-the-sand" attitude, ADC leaders point out. They still believe that the best defense against air attack is a strong offense, but they also realize that ConAD is a basic component of the nation's survival force with a two-pronged job to perform: To afford immediate warning of attack so that the nation's striking forces can begin retaliatory operations before the first enemy bombs are dropped; and to throw up enough aerial barbed wire to restrain, impede, blunt, or repel any planned enemy air invasion before it could reach its targets.

Korea crystalized Air Force plans for making the air defense of America the sole responsibility of a major Air Force command, but the plan had been taking shape since 1946.

In the spring of that year, the shrunken remains of Gen. "Hap" Arnold's World War II Army Air Forces were reorganized. In that war, the Allies had learned that there were three logical divisions to airpower—strategic, tactical, and defense. Therefore, air leaders proposed to build our postwar air establishment along these three main lines.

However, the nation soon forgot the lessons of World War II.

After all, no one had ever bombed America. . . .

At first glance, America seemed isolated and impregnable. On the east and west were trackless oceans—and on the north savannas of frozen wasteland, ice islands, and glacial nothingness.

America had been able in both major wars to mobilize its manpower and its industrial potential in time to insure victory. Wouldn't that always be possible? Then why worry about expensive air defense?

In the months following World War II, many people forgot what long-range airpower had done to Hiroshima and Nagasaki. A false sense of security was wrapped in the certainty felt by Americans. After all, we, and only we, had "The Bomb."

Hence, short-visioned men solved the problem of coping with "insistent air generals" by creating an Air Defense Command—and then negating its effectiveness by allowing it little in the way of men and less in the way of material.

The headquarters of the new command (ADC) were formed at Mitchel Field, New York, with Lt. Gen. George B. Stratemeyer in command.

The job given ADC was to "organize and administer the integrated air defense" of the continental US. It was obvious, however, with little money, few people, and only a handful of planes ADC could only think of training and planning.

"The majority of the combat forces left to the Army Air Forces following demobilization had gone toward the creation of a powerful Strategic Air Command," says ConAD historian Thomas A. Sturm. "Army Ground Forces' demands had dictated that TAC be given second priority. ADC had to settle for what was left.

"The existence of an air defense organization so weak in forces that the best it could do was act as a sort of clearing house for future planning was accepted without question outside the Army Air Forces [but] the Army Air Forces did not agree with this view," he adds.

It couldn't agree because the AAF knew that an air defense could not be built once enemy bombers were already on the way. Air defense was a multi-sided problem. Skilled pilots and radar operators were needed, as well as qualified aircraft and electronics technicians, and these men had to be trained before—not after—the fact of a hostile attack.

General Stratemeyer and the other ADC pioneers decided that an interim force had to be built, using the materials at hand and also as a nucleus of a large command in case war did come.

The airmen, still technically a part of the Army, were not in a position to demand the weapons and hardware they knew were needed, however. Consequently, any real building of continental air defenses had to be postponed. There were other things that had to be settled first, it seemed: Which service would be in charge of peacetime air defense? Would its commander be given enough authority

and logistical support to do a job? Did the US really fear air attack? Was it ready to pay the tab? The men of ADC waited—and fidgeted. It was later than many people realized.

On December 1, 1948, the forces of ADC and the Tactical Air Command were united under a new organization called the Continental Air Command (ConAC). General Stratemeyer served as commander until April of 1949, when he was succeeded by Lt. Gen. Ennis C. Whitehead.

In the change, ADC was reduced to an operational-type organization under ConAC and made responsible only for the combat training of the air defense units. Maj. Gen. Gordon P. Saville, one of the top experts on air defense in World War II and one of the indefatigable leaders in the post-war push for a real air defense wall, was appointed commander of the new Air Defense Command.

The air defenses were still undermanned, still flying outdated aircraft, and still trying to scan the skies with tragically myopic radar "eyes." But under the new organization the air defense commanders, from General Saville on down, were freed for the first time of all worries and responsibilities except those of their major mission: Defense of the US.

By early 1949, two air divisions had been formed to command the Northeast and Northwest Air Defense complexes. The following September the Eastern and Western Air Defense Forces were formed. Simultaneously, Headquarters Air Defense Command was eliminated as an unnecessary step between ConAC Headquarters and the Air Defense Forces, and General Saville was transferred to an air staff position in Washington. Responsibility for the air defense of the nation now rested solely with ConAC's boss, General Whitehead.

Then something happened which vindicated the foresight of the men who had pleaded for air defense in vain while an unheeding country had busied itself with production curves and faster cars: The Russians exploded an atom bomb—years ahead of all predictions.

The Reds' atom bombshell created a number of new problems for ADC, but, at the same time, helped solve the money-manpower dilemma. Funds were allocated for the expansion of the Northwest, Northeast, and Los Alamos-Albuquerque defense areas and for the construction of a temporary system in the vital California area. Increases in manpower were authorized, and the target date of the Permanent Radar Program was telescoped.

When, in June of 1950, President Truman ordered troops into Korea, the Defense Department again immediately increased manning throughout the air defense system by recalling Reservists to active duty, enabling ADC to go on a twenty-four-hour-a-day normal operating schedule.

The increase in strength also enabled the Air Force to make two important organizational changes in the air defense system: (1) The assumption of full command of the tactical forces from the numbered air forces, and (2) the initiation of plans for making air defense the *sole* responsibility of a major Air Force command, thereby freeing the nation's air defense commander from a welter of minor administrative duties.

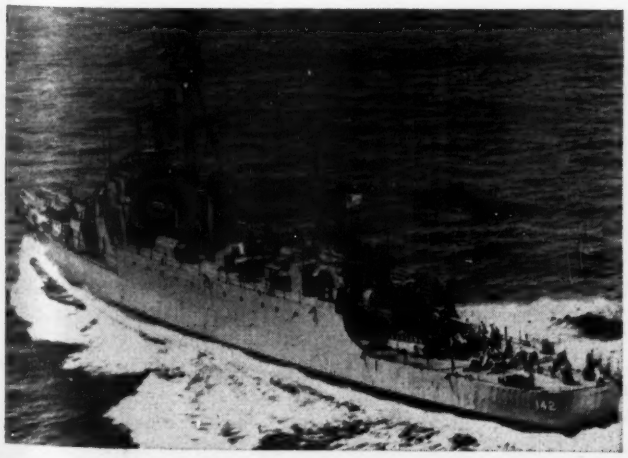
The new organization was taken out from under the wing of the Continental Air Command and designated the Air Defense Command on January 1, 1951, with headquarters at Colorado Springs. Gen. Ennis C. Whitehead was appointed its first Commander and upon his retirement a few months later he was succeeded by Gen. Benjamin W. Chidlaw. The business of air defense moved ahead under the new command set-up, and in a short while people all over America were getting to know their noisy new neighbors, the men who stood on "runway alert" on a hundred different jet fields across the face of the nation.

The cool-eyed young men with the crew-cuts, the cigars, and the deep sense of mission brought an entire new glossary of action and adventure to the American public. They used strange new words that soon entered the American argot: "Hard-hat," "bent-wing," "scramble," "lock-on," "judy," "afterburner," and "stop-cock." If they were nervous, they were "shook," and their standard answer was, "Oh, very well."

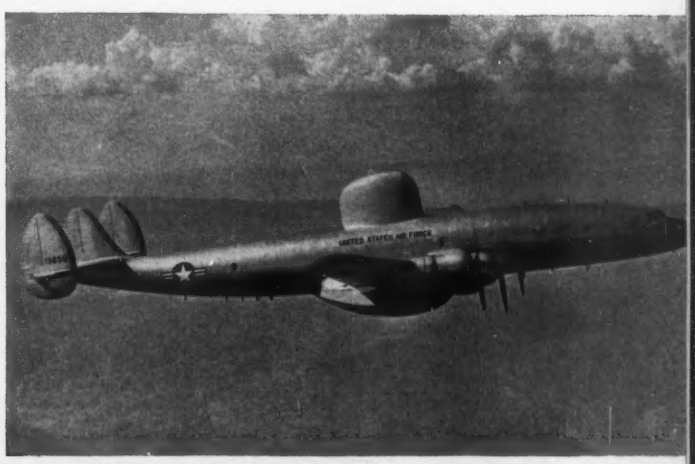
Sitting in their alert shacks in a thin scrim of rain at Niagara, in the shattering cold of Duluth, in the shimmering mirage of Victorville, in the marshy warmth at McGuire, they toiled their night watches, leafing through magazines, dealing "seven-toed Pete," talking pay, piloting, and promotions. Oh yeah, and pretty girls.

These were the new sentries of the Atomic Age. They called themselves "Hired Killers," but many of them were only a year or two away from football fields and college campuses, filled to the brim with *joie-de-vivre*, guts, and geist; as tough as frozen pemmican, as dedicated as mountain monks, and still holding on to much of the youthful idealism that had made them mount the aerial rampart to stand guard for freedom.

(Continued on following page)



Navy radar picket ships far out at sea maintain a constant watch of the skies for any unidentified aircraft.



Lockheed Super Constellation RC-121s provide radar coverage hundreds of miles off the US coast.

At first people resented them. When a young lieutenant "flamed-out" on take-off in a shinola-black night and crashed into a residential district, irate citizens blamed it on "those damn kids buzzing."

People grew afraid of the swept-wing jets that ripped the blue fabric of the sky as they pulled heavenward. Jets were dangerous. They made babies cry and milk curdle. Why not base them some place else?

But a little education began to do wonders. Some people began to realize that these jets which scribbled up the sky with black smoke and white contrails were necessary—and that a person could get used to jet noise just like he could get used to the roar and rattle of the nightly freight train.

The jet was here to stay. It became a part of the American scene.

It had earned its letter.

This is the Air Defense Command in mid-1956. Since 1954 two major organizational changes have been made to streamline it. One was the erection of five new Air Divisions in late 1955, bringing the total number of defense sub-areas to sixteen, which will remain static until the switch is thrown putting the SAGE system into operation (*see page* 58). The second major revision in the command format was the creation of the Continental Air Defense Command (ConAD) on September 1, 1954. Established directly under the Joint Chiefs of Staff, with the Air Force serving as the executive agency, the new organization is a tri-service command "designed to weld together the full military resources of the nation for air defense."

The United States is now divided into three geographical regions for defense purposes: The Joint Eastern Air Defense force has headquarters in Newburgh, New York; the Joint Central Air Defense Force, headquarters located in Grandview, Missouri; and the Joint Western Air Defense Force headquarters have been placed near San Francisco. On the north a firm liaison has been established with the Canadian Air Defense Command.

The "ears" of the system are the Alaskan Command and the Northeast Command, which coordinate closely with ConAD. Their assigned mission is, of course, first to defend their bases, and at the same time provide warnings of attacks in and streaking through their areas.

The defensive warning net is woven of many fine strands. Radar beams sweep along America's coasts from San Diego to the Aleutians and from Savannah to Greenland. Far afloat on the high seas the Navy's radar picket ships patrol, and above them fly the Air Force's Early Warning and Control planes—Lockheed RC-121 Super Constellations.

Starting at Cape Lisburne, Alaska, only two hundred miles from Russia on the shore of the Chukchi Sea, the DEW Line radar fence stretches eastward, paralleling closely the Arctic Circle in a warning radar barrier that may eventually provide a fairly tight warning system against Soviet bombers (*see page* 77).

South of the DEW line, along the fifty-fifth parallel, is the partially completed "Mid-Canada Line," which is north of Canada's settled territory. Consisting of a string of semi-automatic and fully-automatic radars that sound the warning whenever aircraft intercept their beams, it is manned by Canadian troops. The "Pine Tree Chain" rides close to the United States-Canadian border and is jointly operated. In addition to the Atlantic and Pacific offshore and in-shore pickets and proposed Arctic pickets, radar islands called "Texas Towers" (because they resemble offshore oil rigs in the Gulf of Mexico—*see* AIR FORCE, May '56) will line the East Coast from Norfolk to Newfoundland, 100 or more miles offshore. Inside the Continental United States, the miles of air space not covered by radar are being reduced daily. In addition, nearly 400,000 men and women volunteers, including teen-agers and grandparents, staff seventy-three filter centers and some 16,000 observers' posts in thirty-six states. In twenty-seven of these states, a twenty-four-hour "skywatch" is maintained.

When ConAD came into being, the responsibility for the air defense of America was shifted from ADC to the new tri-service organization, unique among military commands. Joint headquarters have been established alongside each ADC echelon up through Air Division. To keep costs to a minimum, ADC officers now wear two hats, performing the duties of their positions on both staffs. A small number of Army and Navy officers have been assigned to the joint headquarters on full-time duty, and, in addition, separate Army and Navy command ladders have been established alongside ADC headquarters at each operating level.

ADC commanders have been named to head up the joint headquarters, with the commanders of the Army and Navy components serving as their principal advisors in matters pertaining to their specialties.

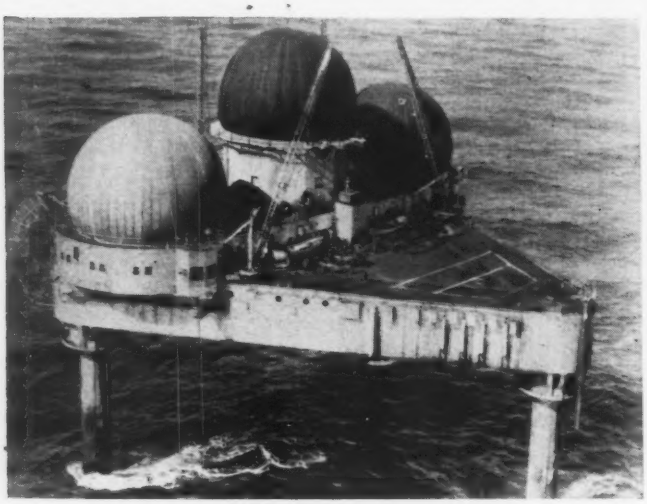
In 1955, the government approved an added $1 billion for air defense; more increases are in prospect. With the money ConAD can give the US a growing margin against calamity. However, top US strategists believe that the Soviet Union may never attempt an attack as long as the US keeps strengthening its aerial obstacle course and its ability to strike back with devastating force.

If it is unfriendly and flies in American skies, the mission of the Air Defense Command is known:

- Detect.
- Identify.
- Intercept.
- Destroy.

The American poet, Robert Frost, has said, "Good fences make good neighbors."

America is building good fences. Let the neighbors be warned—and be good.—END



First AF "Texas Tower" radar station—off Cape Cod, Mass.—recently went into operation.

Ed Mack Miller, a Colorado Air Guardsman and free-lance writer, is fast becoming our most regular contributor.

Top Hand in Logistical Support

For the assignments of today, the missions of tomorrow—Vertol aircraft are trump cards in the game with the highest stakes of all—our national defense.

- The Vertol HUP series: versatile and maneuverable, this helicopter performs in a whole spectrum of naval duties: rescue, liaison, sonar dunking and towing. Hundreds are now in service with the U. S., French and Canadian Navies.
- The Vertol H-21: the familiar "Workhorse" can transport 20 soldiers or 2¼ tons of cargo and land them almost anywhere. A versatile performer, it serves as a "flying crane", flying ambulance and assault transport.
- The Vertol H-16B: largest transport helicopter in the world, the Turbo Transporter will carry 69 troops at over 150 mph. It will revolutionize the art of logistics.
- The revolutionary aircraft now taking shape on Vertol drawing boards will blend the vertical landing and takeoff abilities of helicopters with the high speed performance of jets.

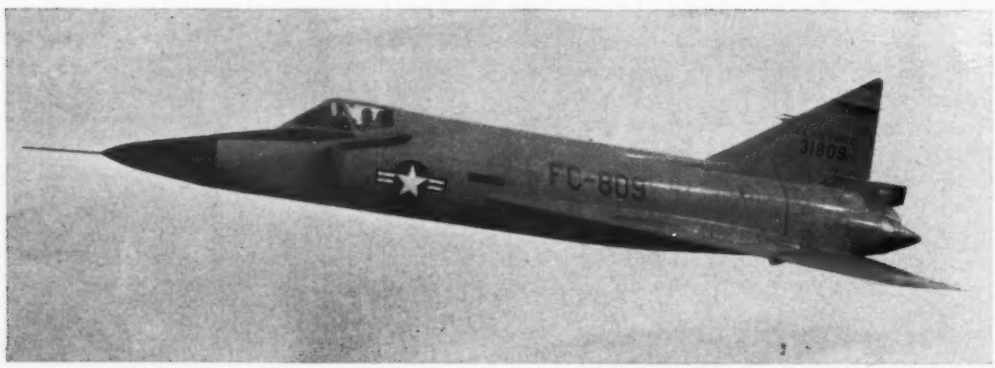
Outstanding job opportunities are available for engineers

VERTOL Aircraft Corporation

MORTON, PENNSYLVANIA

FORMERLY PIASECKI HELICOPTER CORPORATION

The Russians know and fear the lightning bolt in the ADC eagle's claws.



The deadly delta F-102 is the Air Defense Command's first weapon in the Century Series.

The Growth of ADC's Counter-Weapon Arsenal

By Lt. Col. Chester J. Butcher and Capt. J. B. Koelle
WEAPONS DIVISION, PLANS AND REQUIREMENTS, HQ., ADC

THE emblem of the Air Defense Command shows an eagle protecting the North American continent. Its "position in flight and its stern gaze toward the perimeter of the northern hemisphere represent its awareness of the short distance from which the potential aggressor could attack his area of defense." The eagle's talons clutch a bolt of lightning, symbolizing the strength and rapidity with which the Air Defense Command is prepared to do its job.

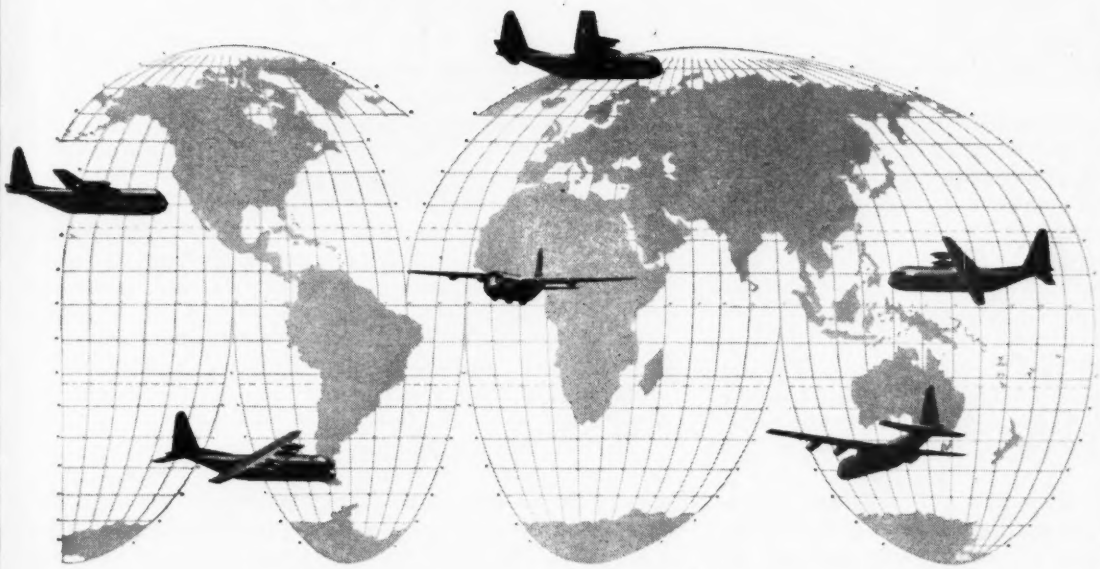
In the last ten years, the ADC lightning bolt has grown apace with the great and difficult job the wary Air Defense has been given. The job has been outlined—the aggressor is known and watched. his Siberian Arctic is already dotted with missile-

(Continued on page 58)

FOR TODAY'S

LOGISTICS NEEDS

THE GO-ANYWHERE, HAUL-ANYTHING TRANSPORT–



PROPJET SPEED. With its four Allison T56 engines, the Hercules flies *faster, farther, at lower cost* than any previous combat transport.

20-TON PAYLOAD. Carries 40,000-pound load for long distances at high altitudes; with its unique push-button paradrop system, spot-drops 25,000 pounds at *one* location.

FASTER TURN-AROUNDS. Minimum loading and unloading time—fuselage floor is truck-bed height; adjustable tail ramp permits vehicles to drive aboard.

NEW MOBILITY. Takes off at 110,000 pounds in 12 times its own length; lands and takes off on improvised runways.

SIMPLIFIED MAINTENANCE. Multiple use of identical assemblies reduces spare-part requirements; easy accessibility of all components reduces service time.

AN ALL-PURPOSE CARGO. personnel and evacuation transport, the Hercules is now being manufactured in quantity at Air Force Plant No. 6, Marietta, Ga. Initial deliveries are for Tactical Air Command's 18th Air Force.

USAF's C-130 HERCULES

Today America's military services are in the aerial trucking business in a big way transporting men and supplies to bases all over the world.

Their problems and requirements vary. But whether the job is air-lifting a division to Japan, airdropping tractors or buildings at Arctic DEWline sites, or rushing missiles and fighter engines to Middle East bases, the need for mobility and versatility has never been so great.

It was for such heavy-duty hauling assignments—*of all kinds*—that America's first propjet combat transport, the Lockheed C-130 Hercules, was designed.

Specifications

Wing span, 132 feet
Length, 95 feet
Gross weight, 124,000 pounds
Cargo payload, 40,000 pounds
Troop capacity,
92 fully-equipped troops
Horsepower, 15,000
Entire fuselage pressurized
and air-conditioned.

Look to Lockheed for Leadership

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AIRCRAFT CORPORATION

GEORGIA DIVISION, MARIETTA, GA.

AIR FORCE PLANT NO. 6

Challenging opportunities in aircraft and nuclear work are available for outstanding scientists and engineers. Inquiries invited.

How SAGE Will Tighten Up Our Air Defenses

AMERICA'S air defense involves a variety of weapons—rocket-ready interceptors, ground- and air-launched missiles, and radar-oriented anti-aircraft guns. To locate and track targets for these weapons, the United States and Canada are building three radar fences along our northern periphery, supplementing these with airborne early warning radar aircraft. In addition, Navy picket ships, ocean-anchored radar islands, "gap-filler" radar, and Ground Observer "skywatch" posts have cross-hatched the continent.

Every man-caused movement in the North American skies is now monitored, and from these front-line sentry posts every second pours a stream of terse messages, targeted to filter centers and combat operations centers in the various air defense divisions.

The voices are urgent:

"Aircraft flash," says a man's voice. "Four multi-bombers, high, no delay, echo Quebec zero zero black, overhead, flying south."

If the "bogie" is unidentified it shows up quickly on the giant plotting board at Continental Air Defense headquarters. The system works fast, but with aircraft speeds climbing to the "double-Mach" and better—even "quickly" has become too long.

Consequently, for some time now a new air surveillance system has been pressed forward toward perfection so that identification of all friends and foes in our skies will be almost instantaneous. To evaluate properly all air tracks along with information as to bearing, distance, height, and speed, the Air Defense Command has evolved, through civilian contractors, a system of mass data processing and simultaneous control of many weapons, through a giant electronic computer that is the brains of a new defense instrument called SAGE (*see* AIR FORCE, March '56).

The word SAGE itself is short for "Semi-Automatic Ground Environment." (The words "Ground Environment" stand for the interrelated electronic equipment installed at ground locations to handle large volumes of information in solving air defense problems.) The SAGE system was developed under Air Force auspices at the Massachusetts Institute of Technology's Lincoln Laboratory in Lexington, Mass. It utilizes the abilities of the electronic computer to accept information, commit it to "memory," calculate, and, finally, record speedy answers to complicated mathematical problems on a radar scope that presents an instantaneous and composite picture of the locations, speed, and direction of all planes within a given area.

The computer automatically calculates the most effective application of such weapons as interceptors, anti-aircraft guns, and missiles. As the air battle progresses, this basic weapons assignment information is transferred simultaneously to geographically adjacent computers. Through radio data links, all-weather interceptors, and long-range missiles are guided to targets automatically by the computer. A system such as SAGE is feasible in the continental United States and Canada only because of the existence of a network of commercial communication land lines not duplicated anywhere else in the world.

The Western Electric Company, under Air Force contract, was brought in to engineer and supervise the installation of the SAGE system. The entire web of existing communications in a specific local area must be engineered as an integrated whole. Such engineering must be carried out at one focal point for the entire system if the system is to operate effectively. This focal point is the engineering department of the American Telephone and Telegraph Co. in New York City. Participating in this effort are representatives of the Associated Bell Companies and a representative of the US Independent Telephone Association. At present the Air Force is leasing lines for all military purposes from about 600 telephone companies, twenty of which are Bell System, 580 independent.

ADC WEAPONS

ADC's pilots and weapons are on constant alert against surprise attack.

launching sites, and his new tundra strips rumble with new bombers.

But the poised lightning bolt is no longer the machine-gun bullet of 1946; it is a warhead fired from the air, powered by rocket, which seeks its quarry by electronic ouija board.

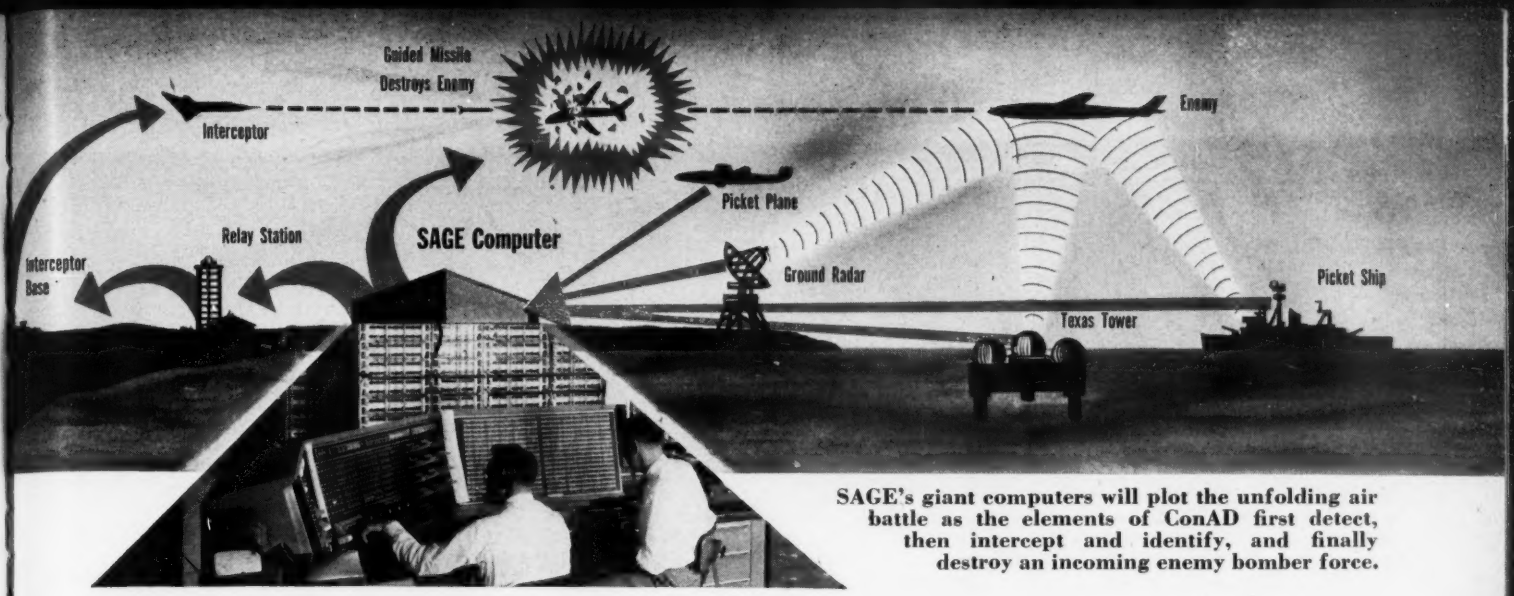
Between World War I and World War II little progress was made in air defense except to refine the existing weapons. In the ten years since World War II, however, the world has become a slave to its own invention, the electronic computer, which may either save or destroy it.

Until the Battle of Britain, air defense had been pretty much catch-as-catch-can. The RAF changed all that, and for the first time the concept of sky fences, of air and ground teamwork in the protection of a vital area, came into being.

The Battle of Britain proved to the Allies that radar-equipped interceptors were essential. The first such aircraft to appear was the British Beaufighter, equipped with airborne-intercept radar. The Beaufighter proved to be outstanding against German night bombing attacks and pointed the way to all-weather operations.

The first true night fighter produced by the United States, the Northrop P-61 Black Widow, saw combat only in the closing months of World War II, but it proved a vital step in the development of the "weapons system concept" in that its airframe was specifically designed to house high-frequency radar and its necessary armament. And even during its short life it far outperformed all other World War II night-fighter aircraft.

In 1946 the air defense of the United States consisted of one squadron of P-61 night fighters and one squadron of Republic P-47 day fighters. But the period from 1947 to 1951 saw the beginnings of a radar and a



SAGE's giant computers will plot the unfolding air battle as the elements of ConAD first detect, then intercept and identify, and finally destroy an incoming enemy bomber force.

Other data comes to the computer from the Ground Observer Corps, height-finding stations, flight plans, and weather stations. The pictures shown on the electronic "scope" are more like a television picture instead of the usual radar image.

Within seconds after being picked up by a radar outpost, the courses of enemy bombers can be plotted by the computers. A Weapons Assigner immediately organizes the attack against them. The computer gives the Weapons Assigner complete information on the enemy craft and the defensive weapons he has available. The Weapons Assigner controls several Interceptor-Director teams, which, in turn, are assigned responsibility for individual interceptions. Consequently, even a raid-in-force can be separated into easily handled chunks. When the fighters are scrambled after the "bogies," the computer shows the time to interception in minutes and also gives vector lines from the fighter bases to indicate the initial heading to be assumed by any interceptors taking off from these bases.

The job of the Interceptor-Director is largely a monitoring task since, from take-off to intercept, the interceptor is controlled by directions fed by radio directly from the computer to the automatic pilot in the lead aircraft.

This automatic feature of SAGE allows the commander and his staff time to analyze the attacks in relation to other threats that may be developing in his area. The air battle commander can "ask" the computer to display the over-all air situation or whatever part of it he wishes to monitor in detail. He can see two F-86s moving toward two hostiles or he can see the whole picture.

As the interceptors reach the final phase of action, the airborne equipment takes over from the computer. The "lock-on" is completed and the "bogie" is blasted from the sky.

After the attack is over, the Interceptor-Director watches while the computer, still hard at work taking care of "clean-up" details, guides the intercepting aircraft back to their bases.

This is the SAGE system as it is being implemented now, a giant cyclops eye which, when fully operational, will be surveying the skies far beyond our vulnerable borders in an unblinking, never-ending search for aerial invaders.—END

CONTINUED

weapons force to provide an intercontinental air defense. Along with the build-up came the realization that an all-weather jet interceptor was needed.

The immediate successor of the P-61 was the propeller-driven North American F-82 Twin Mustang, and following the F-82 came the first US combat jets, the Lockheed F-80 and the Republic F-84 day fighters, which were a great advance, but which had neither night nor all-weather capability.

In 1946 a production contract had been awarded Northrop for an all-weather interceptor called the F-89, to be equipped with the Hughes E-1 fire-control system. By 1949 it had become obvious that the usual development cycle would leave the US without a jet all-weather fighter for too long a time. So the Air Force decided to modify the Lockheed T-33 jet trainer as a short cut to an all-weather instrument for the dangerous "in-between" period.

The resultant aircraft, carrying a pilot in the front seat and a radar observer in the back seat, was named the F-94 Starfire. The F-94 and the F-89 then became the Air Force's first all-weather interceptors, ones that could find targets and destroy them without seeing the targets. Their weakness, of course, was that they were still shooting bullets or cannon ammunition.

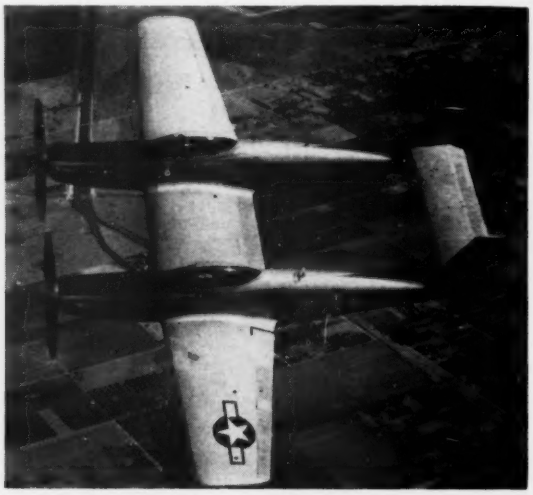
With the improvement of air-to-air rockets, a new technique called the "lead-collision attack" was evolved to replace the antiquated "lead-pursuit" method of firing, which required a chase by the interceptor to put it in a rear-quarter approach for a tail attack.

The first aircraft selected for the ninety-degree angle lead-collision attack utilizing rockets was the North American F-86D Sabre "Dog." Al-

(Continued on following page)

The lethal cargo of the F-86D Sabre "Dog" includes 2.75 air-to-air rockets.

The sleek Northrop P-61 was the first true night fighter built in the US. It saw action during the closing months of World War II.



The North American F-82 Twin Mustang was a fine plane but gave way to our first combat jets.

ADC pilots "scramble" as buzzer warns of unidentified aircraft approaching.

though the F-86D carries a crew of just one man, the increased capability of radar to solve the rocket-firing problem automatically (plus a vastly improved autopilot) substantially lessened the demands of the pilot and radar-observer functions. This plane, equipped with the E-4 fire-control system, is now the "night-sight" mainstay of the present air defense inventory. The improved versions of the Hughes fire-control system, the E-5 and E-6 systems, have now been placed in the F-94 and F-89, making the dual-place interceptors up-to-date rocket-launching platforms, good in any weather.

The experiences gained in all-weather interceptor procurement and the contributions of the latest technical and electronic advancements played a part, along the way, in the formulation of a new USAF philosophy—the "weapons system concept."

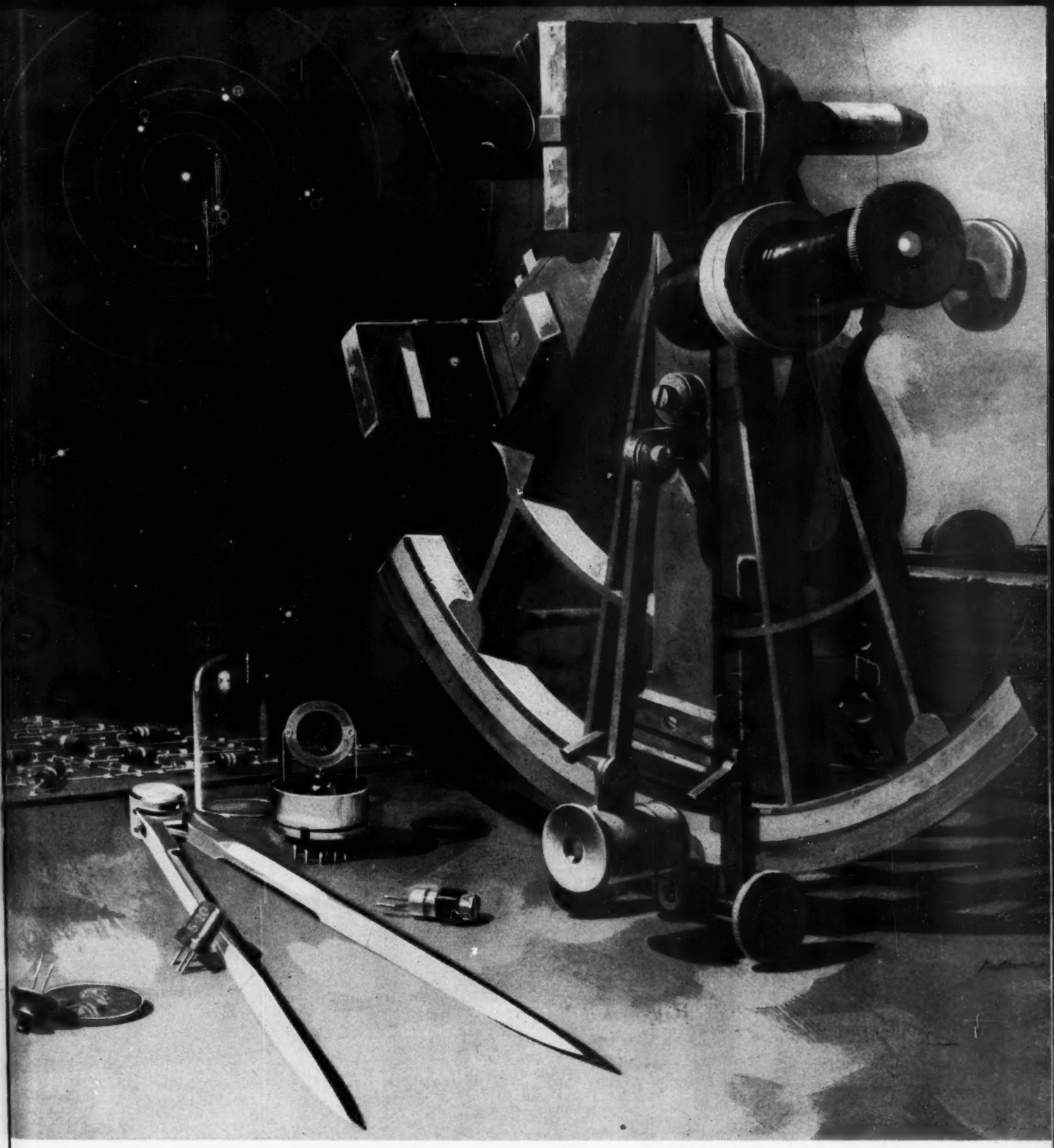
The weapons system idea recognizes the fact that the most effective weapon (aircraft, guided missile, etc.) is one in which all elements are developed as part of an integrated system to accomplish a specific tactical objective.

The term "elements," or sub-systems, includes not only the electronic equipment, armament, and other airborne components, but all the ground support and test facilities as well as the skills necessary to operate the weapon.

The weapons systems concept was conceived at a conference of representatives of the Air Force, the aircraft industry, and the electronics

(Continued on page 64)

In 1946 the air defense of the US consisted of two squadrons, one of them equipped with the Republic P-47 fighter.



ON COURSE—Unceasingly, Northrop directs its progress toward development and production of the most effective weapons for national defense. Notable achievements by Northrop include Scorpion F-89 interceptors; unmanned, far-ranging Snark SM-62 A-bomb carriers; and Radioplane Company's pilotless drones and missiles. New horizons in a multitude of fields are continuously scanned by Northrop engineers and scientists, years in advance of charted goals. Working in close coordination is the well-balanced Northrop production force, thus insuring efficient, economical output. Already, the course is set by Northrop for new weapons of tomorrow, their successful production and prompt delivery assured by this coordinated effort.

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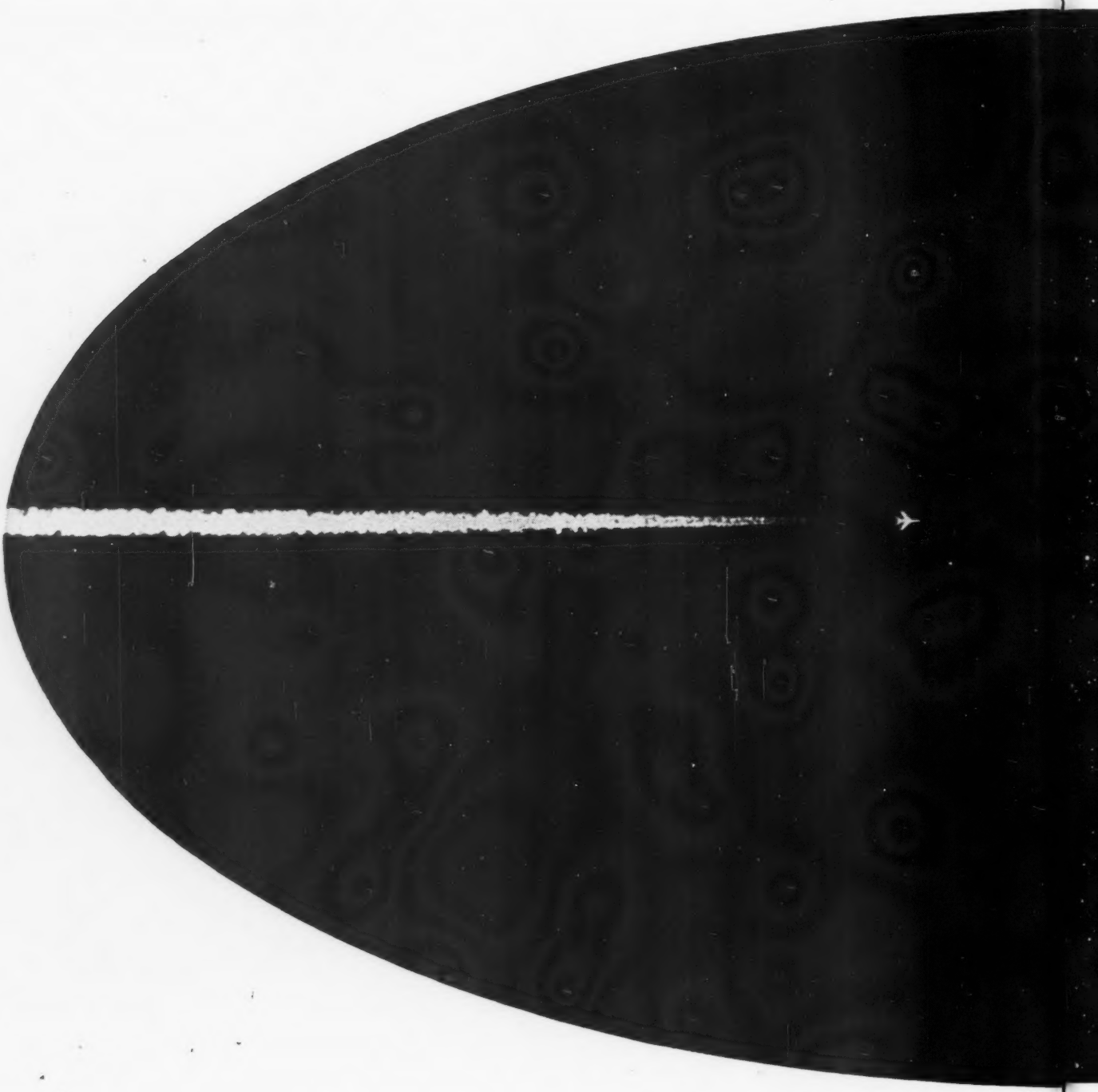

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A special 40-inch lens camera took this photograph of North American's F-100C SUPER SABRE as it streaked to the world's first official supersonic speed record. The F-100—produced in quantity and on schedule—is the backbone of the U.S. Air Force's operational supersonic squadrons, both here and abroad. Latest F-100 development is the "D", first and only supersonic fighter-bomber in production. The F-100 series, following the famous F-86s, is another example of North American's continuous development and on-time production of effective airplanes for our nation's defense.

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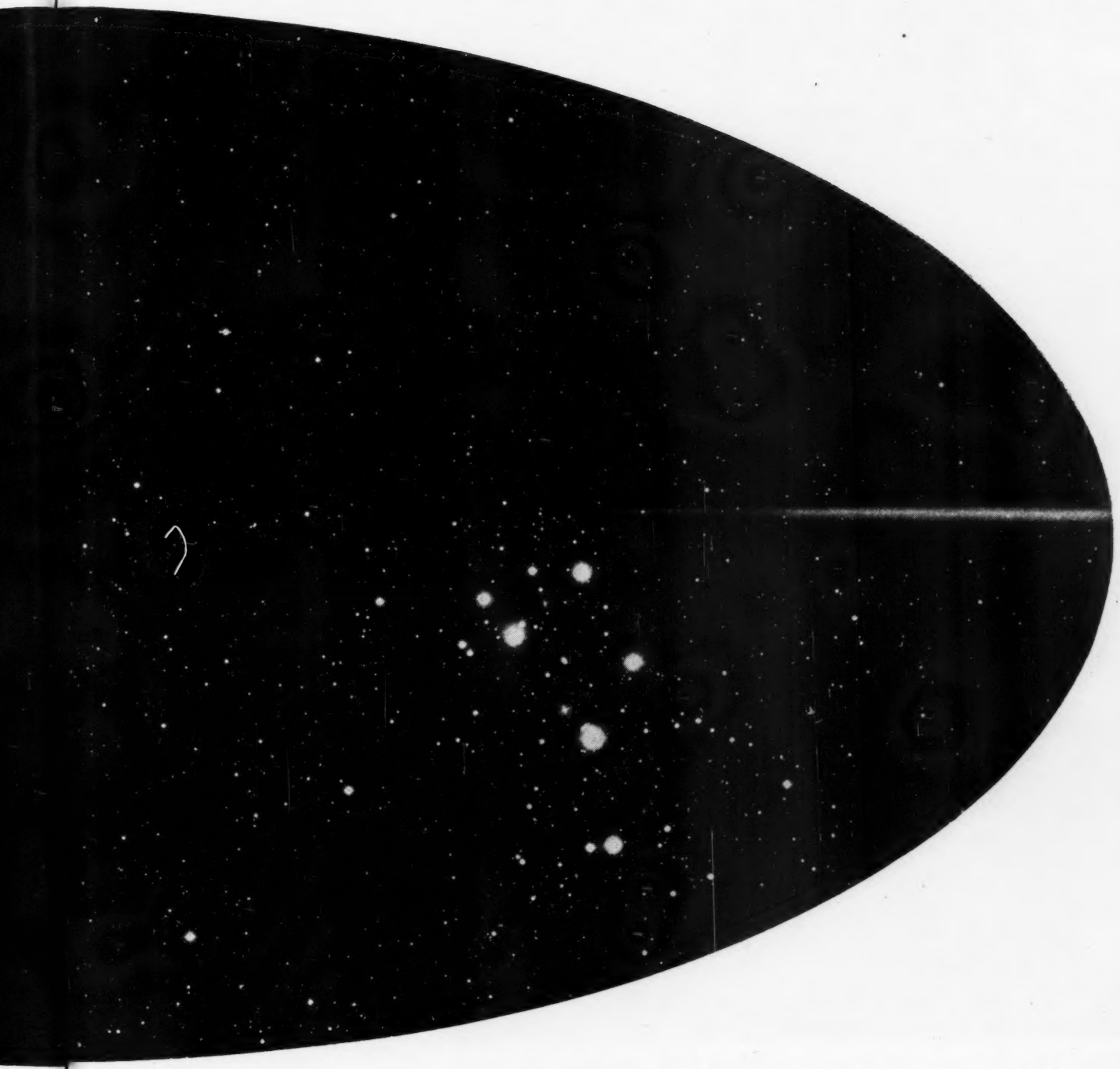

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BEYOND SIGHT
TOMORROW

Side by side with North American's continuous development of improved supersonic manned aircraft is the work on an equally vital project—complete weapons system responsibility for the U.S. Air Force SM-64 NAVAHO Intercontinental Guided Missile. This automatically controlled and guided "bird" will be driven by a high-thrust rocket engine, and will fly higher and faster than man can see with the naked eye. The Air Force NAVAHO project is a major factor in our country's program of developing long-range missiles.

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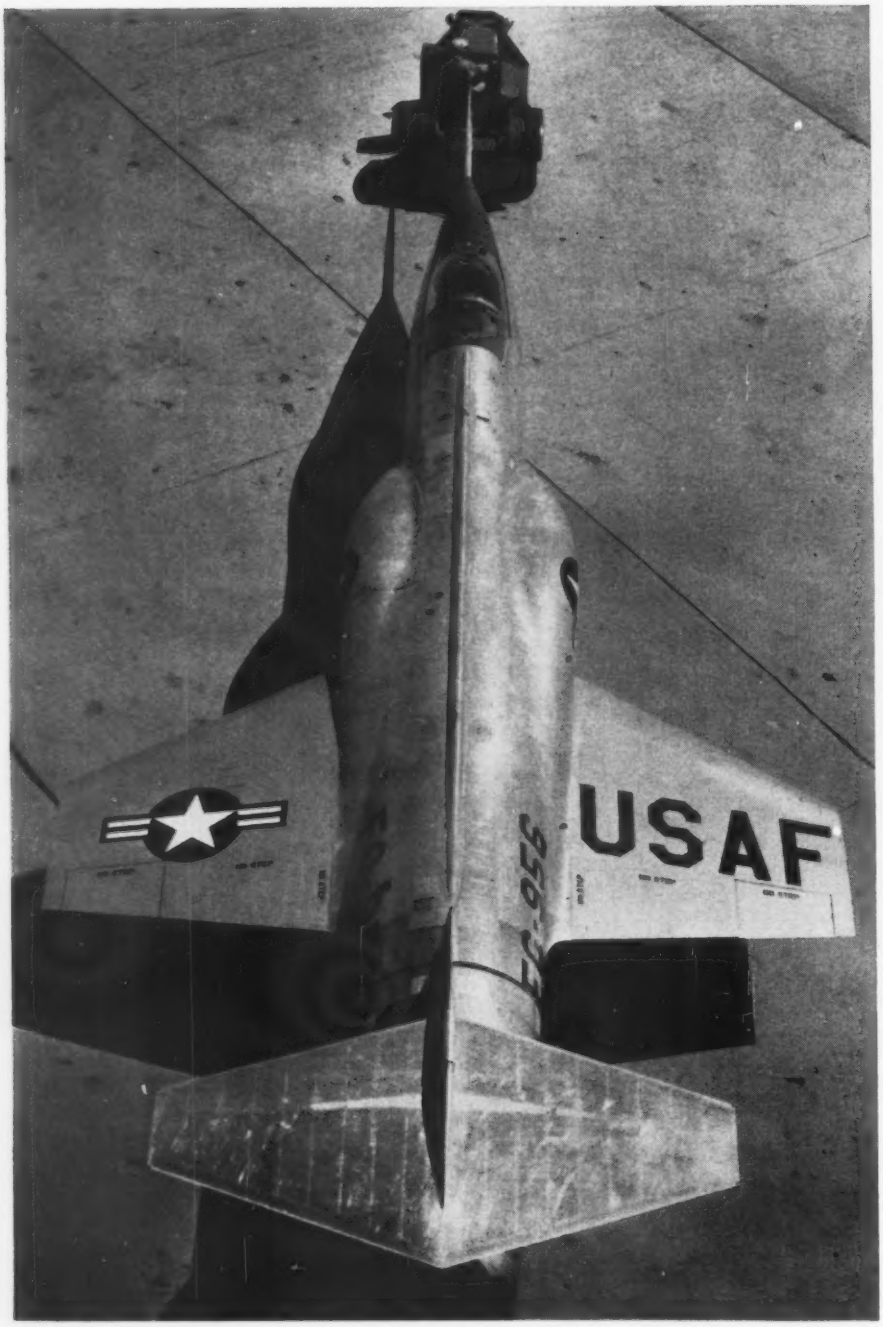


General Partridge's men are giving the Lockheed F-104 Starfighter more than just a once over, to see how this beauty might best help ADC defend the US.

industry in May 1949. At the conference, industrial representatives present were given a statement of the problem confronting the Air Force—development of an all-weather interceptor weapons system capable of countering the 1954-1960 threat—and were asked to advance their recommendations.

The industries enthusiastically attached their approval to the new weapons system concept, agreeing that, while both the fire-control system and aircraft would be developed in close coordination, the fire-control system should be decided upon before a final specification was drawn up for the aircraft, so that the plane could be "built around it."

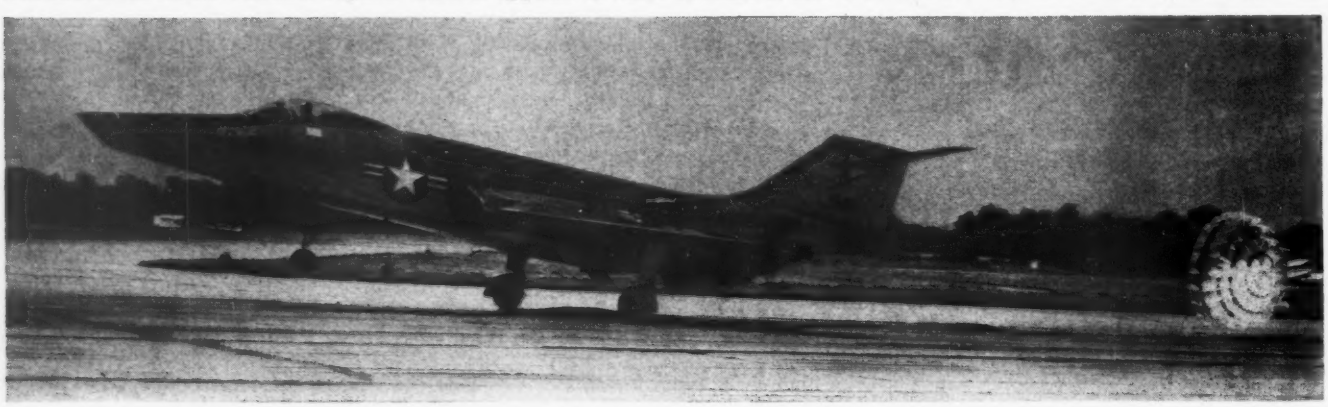
In the fall of 1949, the various companies began bidding, and, in May of 1950, Hughes Aircraft Company was selected to initiate the interceptor fire-control system, designated "Project MX-1179." In the same month, the airframe competition was initiated (Project MX-1554), and in June 1951 three contractors—Convair, Republic, and Lockheed—were chosen to begin preliminary development.

During the month of September 1951, the three airframe programs were re-evaluated. Lockheed withdrew at this time, owing to other commitments. The advanced Republic proposal was reoriented as a long-term research development. Convair was selected as the exclusive contractor for Project MX-1554. The new interceptor was designated the F-102, and the Hughes MX-1179 integrated electronic control system was designated the MA-1.

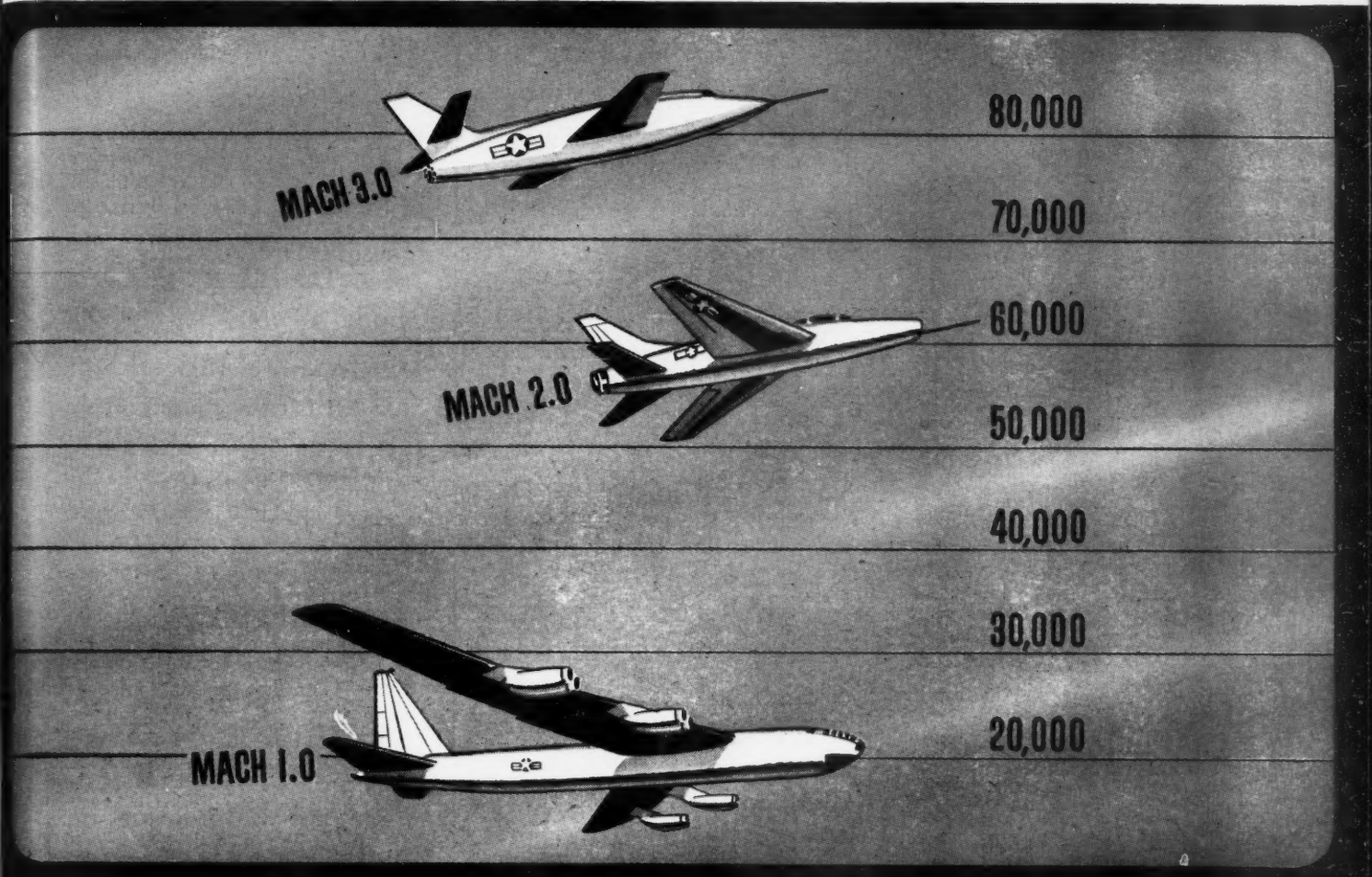
Although ADC still depends mainly on the F-86Ds, F-89Ds, and F-94Cs, the F-102 is just beginning to be introduced into operational elements. But other members of the "Century Series" of fighters may soon be seen in ADC as augmentation forces even

(Continued on page 67)

McDonnell RF-101A Voodoo. Fighter version appeals to ADC because it has endurance enough to make repeated passes.



Introducing a new concept in air data computations



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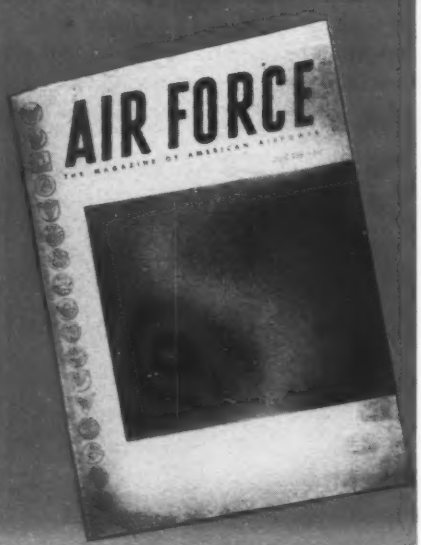

THE AUGUST ISSUE OF AIR FORCE will have command charts, identifying by name and function the top leaders of the Air Force; a complete guide to Air Force bases, with maps and background information . . . a full hundred pages of permanent reference material, the kind that makes people ask for each anniversary issue, up to ten or twelve months *after* publication.

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They'll be there to get squared away on the direction our airpower is taking —to listen to Air Force Chief of Staff Nathan F. Twining, and Secretary of the Air Force Donald A. Quarles, among others.

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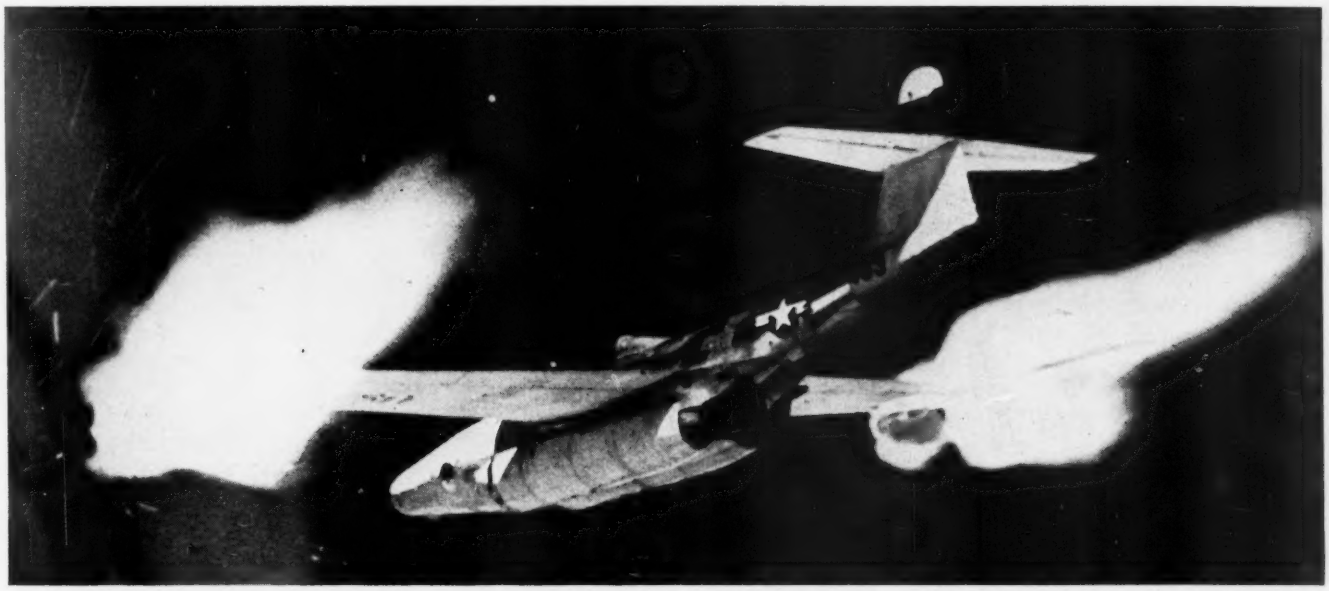


An ADC Northrop F-89D Scorpion shows off its striking power by shooting a salvo of 2.75-inch "Mighty Mouse" rockets.

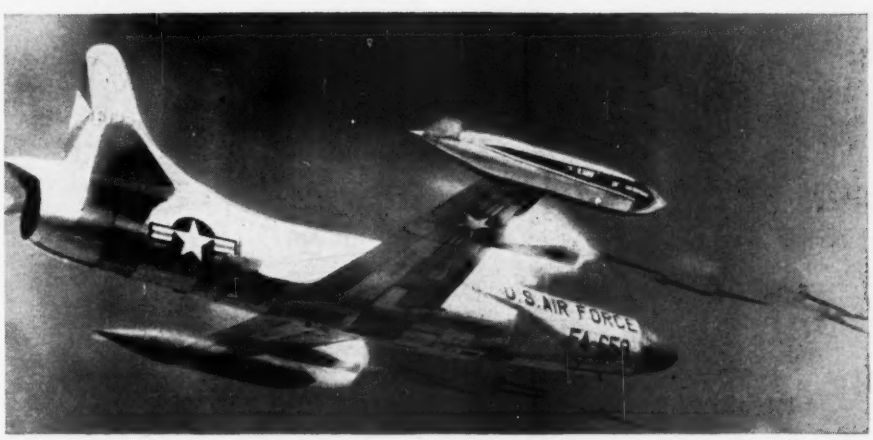
if they cannot be converted to all-weather fighters. The new philosophy has affected the Air Defense Command to the extent that no longer may an observer say that any one plane is a "SAC plane" or a "TAC plane" or an "ADC plane." As one ADC weapons expert said recently: "Now, any aircraft that has ADC potential, we look at."

This includes the McDonnell F-101 Voodoo, which most people associate with the Strategic Air Command, but which appeals to ADC because "it could stay up there and make repeated passes at an enemy bomber instead of squirting out a load of rockets and then having to head for home with the gas gauges nibbling around zero."

The same applies to the sleek Lockheed F-104, only recently unveiled in all of its wingless beauty. General Partridge's men are giving the Starfighter more than just the once over, seeing how this Mach-cracking beauty might best help ADC defend the American heartland. As the F-102 and other new fighters come into the program, it appears that the F-86s, F-94s, and F-89s will be gradually phased out to Air National Guard and Reserve components.

For its striking power, ADC, of course, can count on thousands of Air Force, Navy, Marine, Reserve, and Air Guard jet interceptor aircraft, plus those of the Royal Canadian Air Force, which, naturally, operate under independent command, but can be called on if "the stuff hits the fan."

In its quiver of lightning-bolts, the ADC defense eagle has some very potent noise-makers, and more are on the way. The Falcon, a 100-pound air-to-air rocket with its own guidance system, is the big arrow at the moment. It is unique in that it can be launched miles from a target without visual contact and will snake its way right up to the enemy jet's tailpipe with a horrible and final "whoosh." One of the smallest guided missiles in production (seventy-seven inches) the GAR-1 ("officialese" for the Falcon) will provide the F-102 with maximum kill potential.



Lockheed's F-94C Starfire can find and destroy targets without seeing them.

North American F-86D Sabrejet—getting old, but still playing a vital role.

GARs (Guided Aircraft Rockets) became feasible as a result of recent technical developments in many fields, notably those of rocket design and miniaturization of electronic components.

The Falcon is the result of a program dating back to January 1947 when the Hughes Aircraft Company was awarded a contract to develop a guided aircraft rocket for interceptor use. It works on the principle of flying

(Continued on following page)

a true collision course with its target, making necessary corrections by means of an electronic guidance system. Hence, the Falcon, equipped with a highly lethal warhead, should substantially increase the destructive power of our future interceptors.

A guided aircraft rocket naturally has several major advantages over small, unguided rockets. First, it can be fired from a greater range, a fact which complicates the bomber's self-defense problem. Secondly, a GAR has a much higher kill potential against a maneuvering target because of its guidance feature—it can correct for both launching errors and errors induced by changes in the target's flight path after the Falcon is on its own. Last, it allows greater flexibility of interceptor tactics owing to its increased range and maneuverability.

Corresponding to the development of air-to-air guided missiles has been the emergence of surface-to-air interceptor missiles which seek out their targets electronically.

These interceptor missiles are, as their name implies, pilotless aircraft; they will operate along with manned interceptors within the same ground environment to provide a varied and powerful air defense potential.

Among the advantages which interceptor missiles have over manned interceptors are: They can become airborne, climb, and cruise more rapidly, and, being free of human tolerance restrictions, they can operate at higher altitudes and perform tighter maneuvers.

The fact that an interceptor missile is a one-shot weapon eliminates many of the problems of manned interceptors such as a durability of materials, long-term maintenance, and return-to-base and landing systems. Also, since the missile is both carrier and armament in itself, there is no need for armament launching systems.

The biggest disadvantage of the interceptor missile is that it lacks the versatility and power of decision that only a human brain "on the scene" could supply. Once launched, a missile is irrevocably committed on its course, but it is expected that this detrimental factor will be overcome once better control and data-transmission systems are perfected.

Interceptor missiles currently slated for air defense use include two long-range weapons, the Talos and the Bomarc (*see page 42*).

Actually, the Talos constitutes the first evolution in the new theory of anti-bomber weapons. The McDonnell-developed missile, first developed by the Navy for fleet defense, utilized ramjet power and rockets to extend its range. Several variants, including the Talos W and L, are being developed to extend the lethal range of warships and fixed installations. Land-based uses for the Talos are also being plotted, but both sea and land defense utilization of the missile will, for the most part, be the concern of the Continental Air Defense Command.

The Hughes GAR-1 Falcon guided rocket, striking power of the fast F-102.

Specifically, the Bomarc fulfills the most needed air defense mission—a long-range pilotless aircraft to intercept and destroy enemy bombers. The Bomarc (Boeing's IM-99) can be launched quickly, ascending vertically to a tremendous altitude. Increased speed is produced by two powerful ramjets.

In addition to interceptor missiles the air defense arsenal also includes the short-range, surface-to-air Nike, operated by the Army Anti-Aircraft Command in close coordination with the other air defense facilities. Subject to ConAD control, Nikes are already guarding thirteen vital target areas. This radar-directed, ground-to-air guided missile is designed as a point-defense weapon and its capabilities are as yet unproven.

Besides the Nike, other Army weapons which ADC has available are 120-mm. guns, ninety-mm. guns, and the seventy-mm. Skysweeper. The latter, designed primarily for use against low-flying aircraft, possesses its own radar and computer right on the gun carriage. Once the radar locks on a target, all the crew needs to do is keep loading ammunition at the rate of forty to fifty rounds a minute—the Skysweeper does the rest. However, it is all but outmoded by the speeds and altitudes available to attacking aircraft.

Future air defense calls for versatile, yet basic, systems that will be effective against any of several types of threats.

In fact, the Air Defense Command is leaving no scientist unturned in an effort to find the answers to the complicated ADC mission problem: "Defend the United States Against Air Attack." Every idea or plan that seems to have merit is being investigated, among them atomic weapons. Witness General Partridge's statement at the recent AFA-sponsored Jet Age Conference in Washington: "The day is not far off when we shall have atomic weapons at various stations in storage and on the planes in flight."

For future implementation, ADC has also evolved a program called the "Family of Four" philosophy. The "Family of Four" concept envisions four basic weapons systems: A long-range interceptor, a medium-range interceptor, a medium-range interceptor missile, and a short-range surface-to-air missile. These weapons will operate in the SAGE ground environment (*see page 58*), complete with the seaward and northern extensions.

Air Force planners believe that this defense should, within imposed budgetary and manpower limitations, give us the optimum "kill-potential" against a threat, the exact nature of which cannot be predicted with any degree of certainty.

The greater and more varied the threat, the more exacting the requirements of the air defense weapons needed to counter it.

Hence, if we are to fully achieve a superior air defense, the full extent of our technological resources must be applied to the production of effective weapons systems.

ADC plans to do just that, and perhaps tomorrow's Centaurs, Gorgons, and Fafnirs—along with the F-200s that will pierce the thermal barrier—will help keep the peace, albeit an uneasy one, for the next generation.

The chance is worth the effort . . . and the cost.—END

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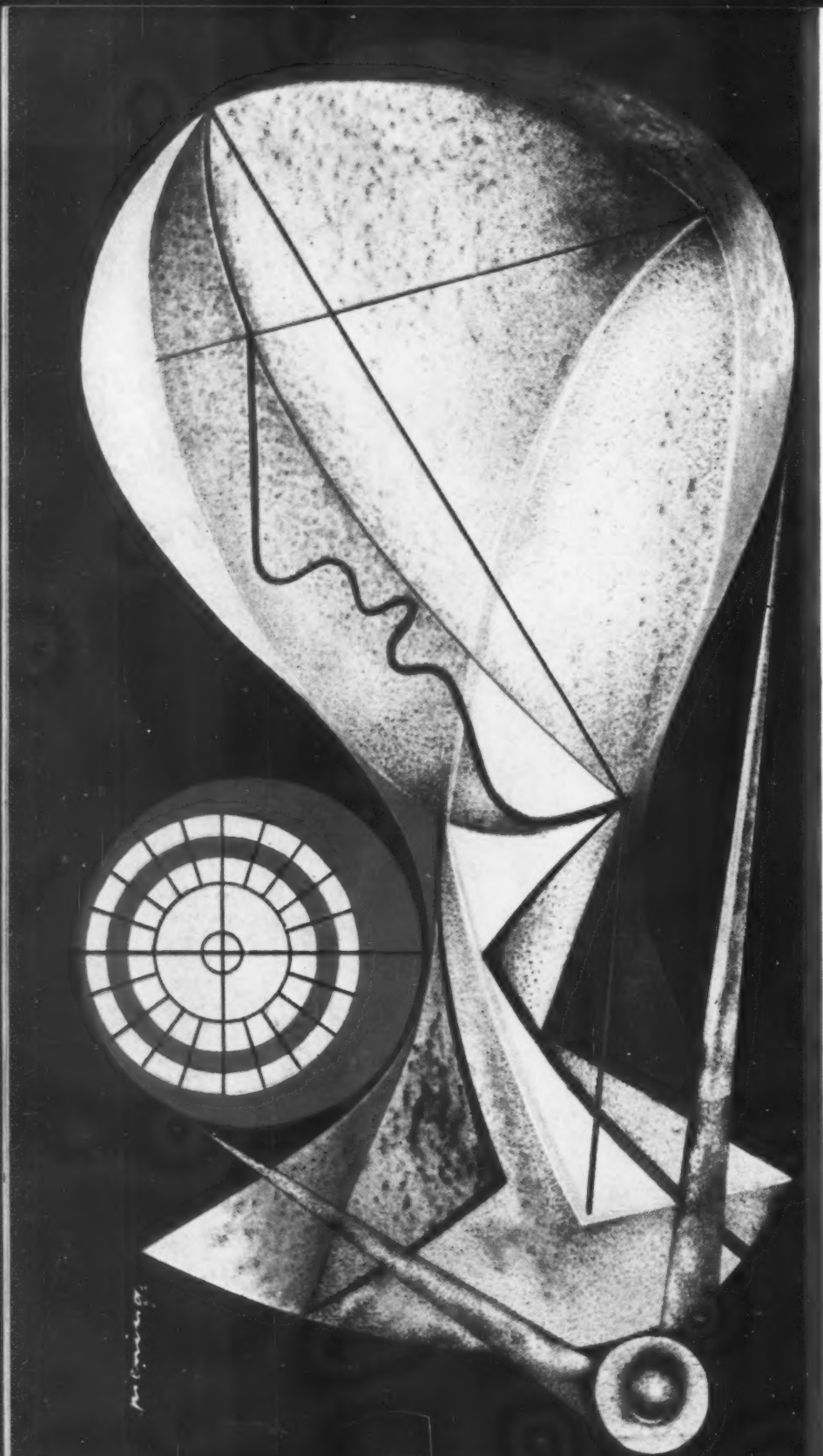

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Lockheed F-104

World's Fastest Fighter

THE AF's newest fighter—said to be the world's fastest combat plane and capable of climbing as fast as the speed of sound—was unveiled April 16 before some 200 newsmen at Palmdale, Calif. The plane, Lockheed's F-104A Starfighter, has been ordered in quantity and is scheduled to go to Tactical Air Command units. But it's a good bet the revolutionary new fighter will also play a role in the Air Defense mission, because it is being closely watched from General Partridge's headquarters in Colorado Springs.

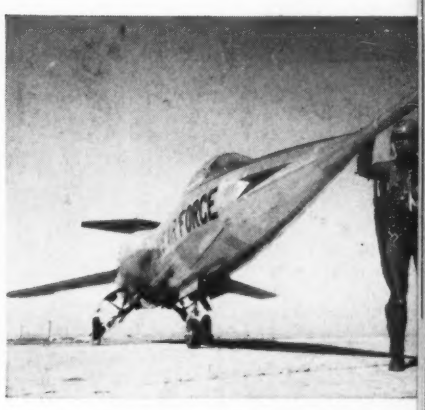
Putting the Starfighter through its paces, Lockheed's chief test pilot Herman R. Salmon whizzed by an F-94C Starfire at what was estimated by observers to be from 1,300 to 1,400 mph. Salmon emphasized that he was keeping the plane below its full speed and said, "We could take back the world's record from the British with the F-104 any time we wanted to." (The official speed record of 1,132 mph is held by a British Fairey Delta 22 jet fighter. See "Airpower in the News," April 1956 AIR FORCE.)

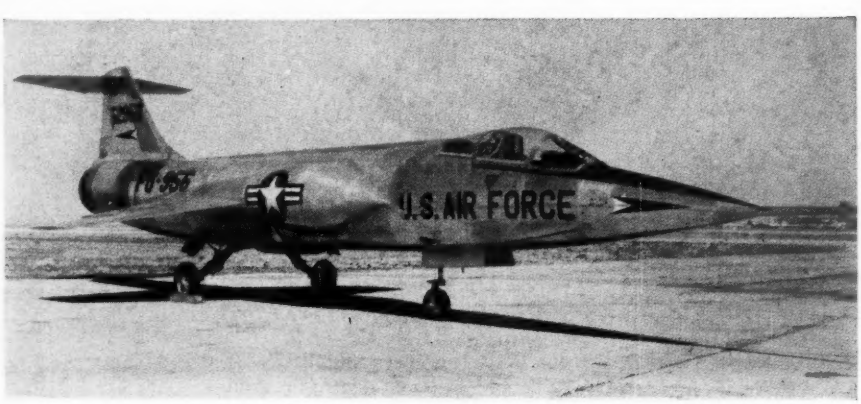
Looking more like a missile than a piloted fighter, the plane flies on wings that are only .016 inches thick at the leading edge and only seven and one-half feet long from fuselage to tip. Because of the extremely thin wings, the main landing gear retracts into the fuselage and the jettisonable tiptanks are fitted over the wingtips like gloves. It is powered by one of the world's most powerful engines, the new General Electric J-79—said to develop 12,000 pounds of thrust.

The fighter has a downward ejection system, first of its kind to be installed in a production fighter, and a horizontal stabilizer located almost at the top of the sweptback vertical fin and called a "flying tail" because the entire surface moves and thus uses no elevators.

Dimensions of the Starfighter are: height, thirteen feet, six inches; length, fifty-four feet, nine inches; and span, wingtip to wingtip, twenty-one feet, eleven inches.—END

Lockheed XF-104, prototype of the F-104 in flight over Edwards AFB, Calif. Production models may be capable of Mach 2.3 speeds.





F-104A wings are thinner than those on rocket research planes—and so sharp that sheaths are used on edges to protect ground crewmen. In photo, covers conceal air scoops for security reasons.

Because wing is extremely thin, landing gear retracts into fuselage. Horizontal stabilizer has no elevators, but moves as a whole unit.

DEDICATED TO AMERICA'S DEFENSE

THESE AIR FORCE BOMBERS are mainstay of Strategic Air Command. The B-47 (in flight) is powered by six G-E J47 jet engines. Both the B-52 (on the ground) and the B-47 are protected by G-E electronic defense systems.

"America faces a two-fold challenge. Not only must our ready-to-go airpower be sufficient to deter any potential aggressor today, but we must hold this vital supremacy in the future. Only the science and technology of American industry can provide the advanced development needed to protect our security . . ."

NATHAN F. TWINING,
General, USAF, Air Chief of Staff

How General Electric works with the Air Force to help in

PROTECTING OUR SECURITY

The United States Air Force today holds an umbrella of security over America. It protects us two ways. First, our strong air defense is ever-ready to challenge an air invader. And secondly, the strategic power of the Air Force is a constant check against any potential aggressor.

Examples of this power are the two Strategic Air Command bombers shown on the opposite page. The medium range Boeing B-47 with its powerful General Electric jet engines, and the intercontinental B-52 are now flying over 3,000,000 miles each day from bases in Africa, North America and Europe. Protected by G-E electronic defense systems, these key planes are the strategic safeguards of the free world today.

Security for Tomorrow

Continued security for the nation requires more than ready-to-go aircraft. The following reasons show why the research and development efforts of companies like G.E. are absolutely vital to America's future:

1. Superior airpower, in sufficient quantity, is essential for peace.
2. But constant research and development is necessary to *maintain* this air supremacy in years to come.
3. Our government needs the support of industry's private investment in research and development. The technological progress that industry has proved itself capable of contributing is a vital and necessary ingredient to continued improvement of equipment for defense.

General Electric's Role In Defense

On the following two pages are shown some examples of how General Electric's teamwork with the Armed Forces is producing top defense equipment. From advanced electronic defense systems to powerful new jet engines, these defense tools emphasize that security can be achieved. It does not come easily, but it is possible. And we must have it.

235-4

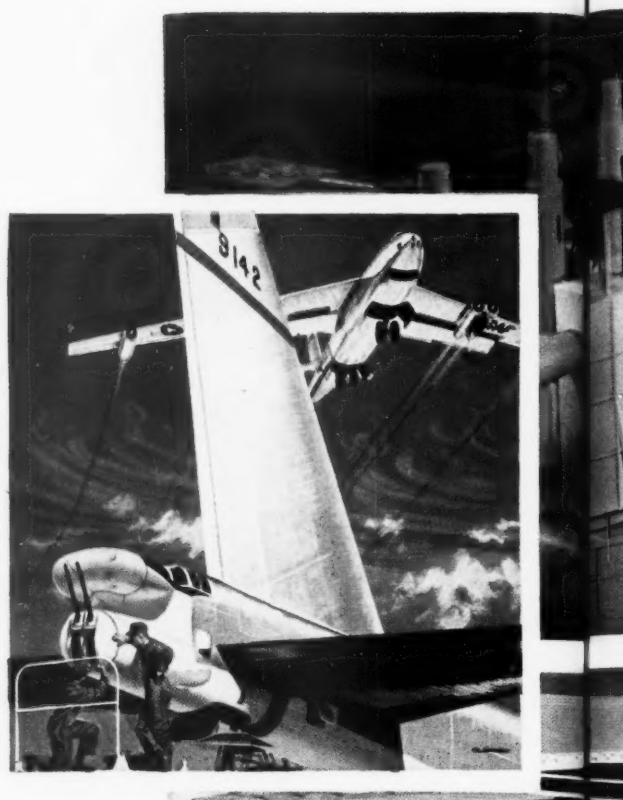
To see how G. E. is helping solve these critical national problems, please turn the page

Progress Is Our Most Important Product

GENERAL ELECTRIC

PROTECTING OUR SECURITY

General Electric speeds development of tomorrow's jet engines, electronic defense systems



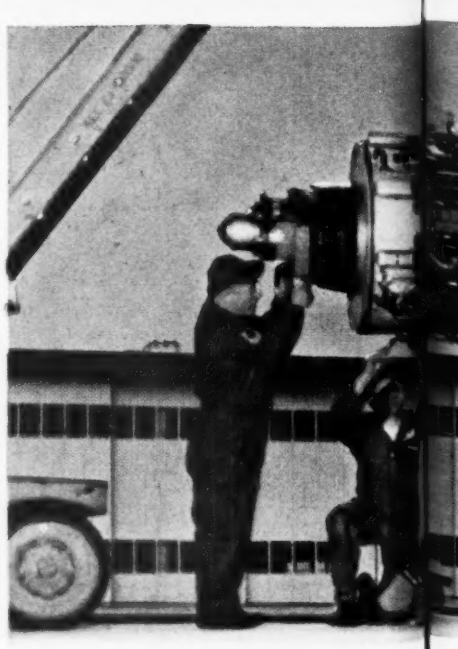
In carrying out its aim of helping the Armed Forces continue to develop even more advanced defense equipment, General Electric today operates facilities with a replacement value of more than $150,000,000. About half of these are devoted exclusively to the development of jet engines, armament, autopilots, electronic systems and similar defense equipment.

Air battles simulated on ground

Part of this investment was for DYNAT (Dynamic Accuracy Tester) which General Electric perfected in order to "wring out" airborne armament systems on the ground. By simulating battle conditions, DYNAT enabled G-E engineers to save months of in-air testing of electronic armament, thus saving thousands of dollars of taxpayers' money.

$20,000,000 Jet Engine Test Facility

Scheduled for completion in 1958, this huge facility will enable engineers to test new jet engines under simulated flying conditions at 2300 mph and at "altitudes" of 11 miles. Located in Evendale, Ohio, the testing center will be the most advanced of its kind, and will help engineers cut the long lead time needed to develop powerful jet, rocket, and atomic engines.

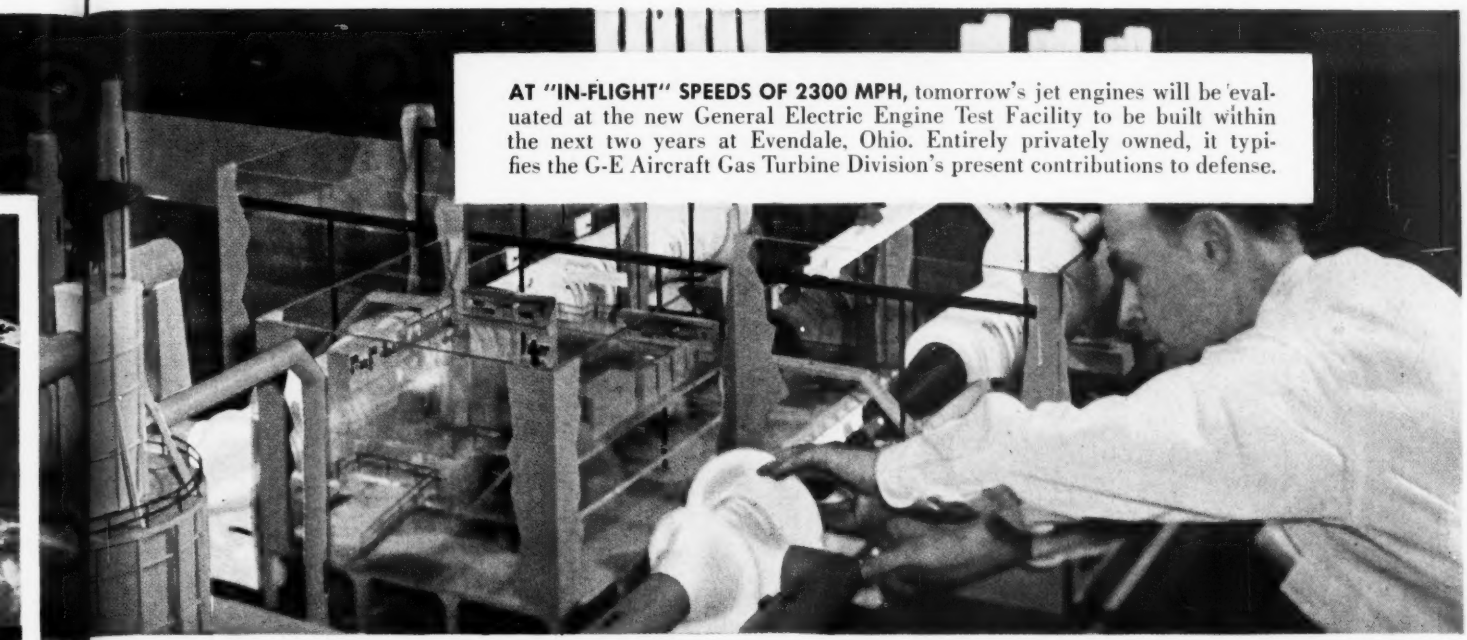


Part of over-all program

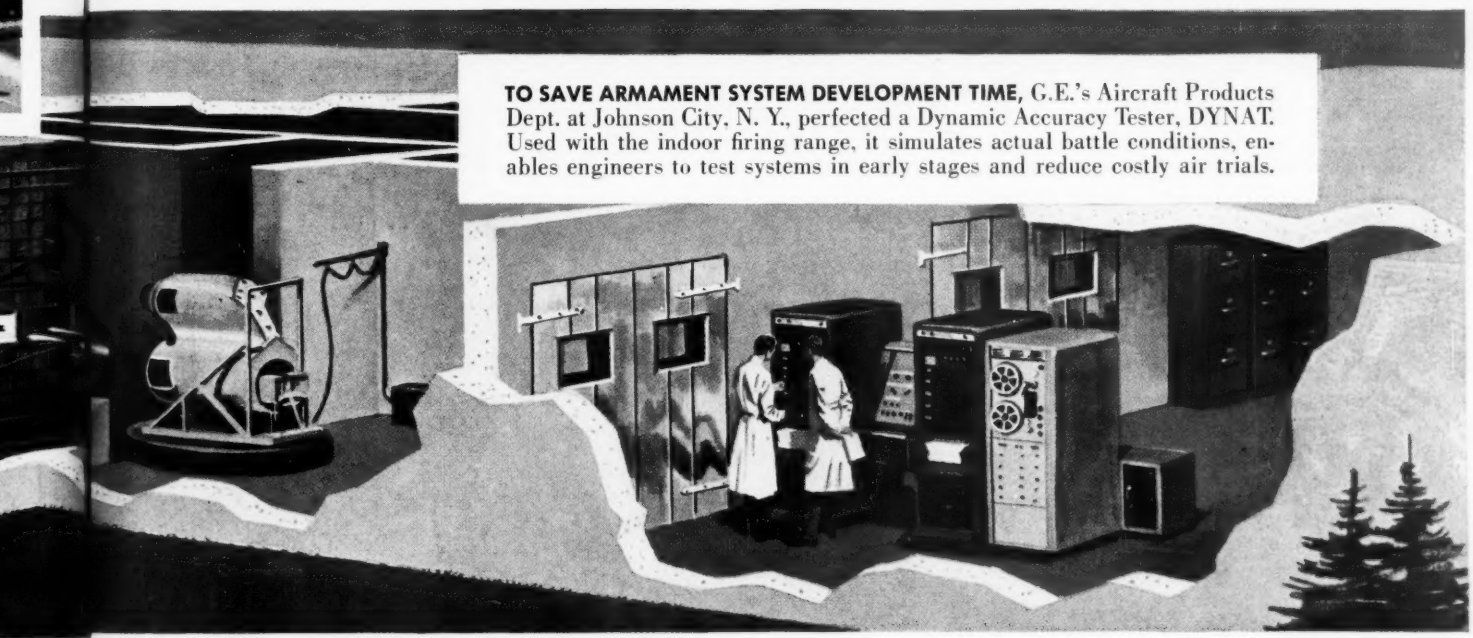
These are just two examples of General Electric's effort to deliver the advanced equipment needed by our Armed Forces to protect the nation. By anticipating America's airpower needs and by providing the facilities needed to deliver new progress, General Electric continues to play its vital role in our defense. 235-4

Progress Is Our Most Important Product

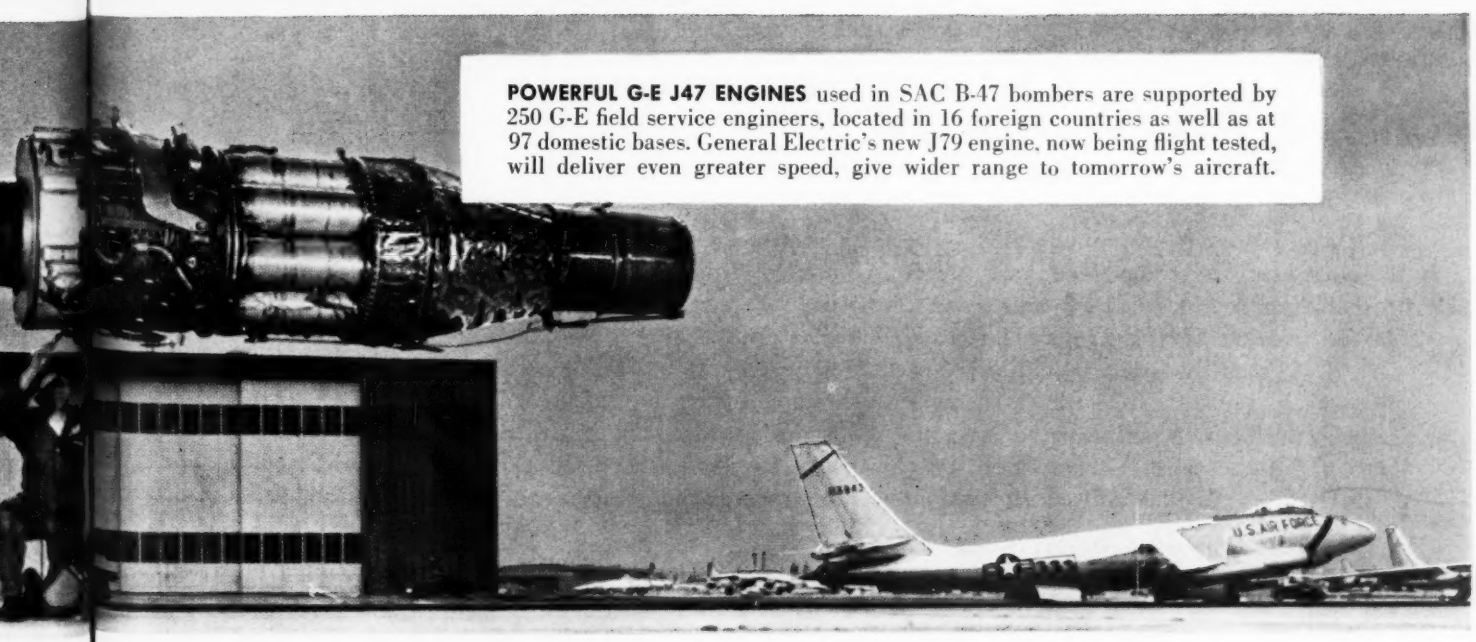
GENERAL ELECTRIC



AT "IN-FLIGHT" SPEEDS OF 2300 MPH, tomorrow's jet engines will be evaluated at the new General Electric Engine Test Facility to be built within the next two years at Evendale, Ohio. Entirely privately owned, it typifies the G-E Aircraft Gas Turbine Division's present contributions to defense.

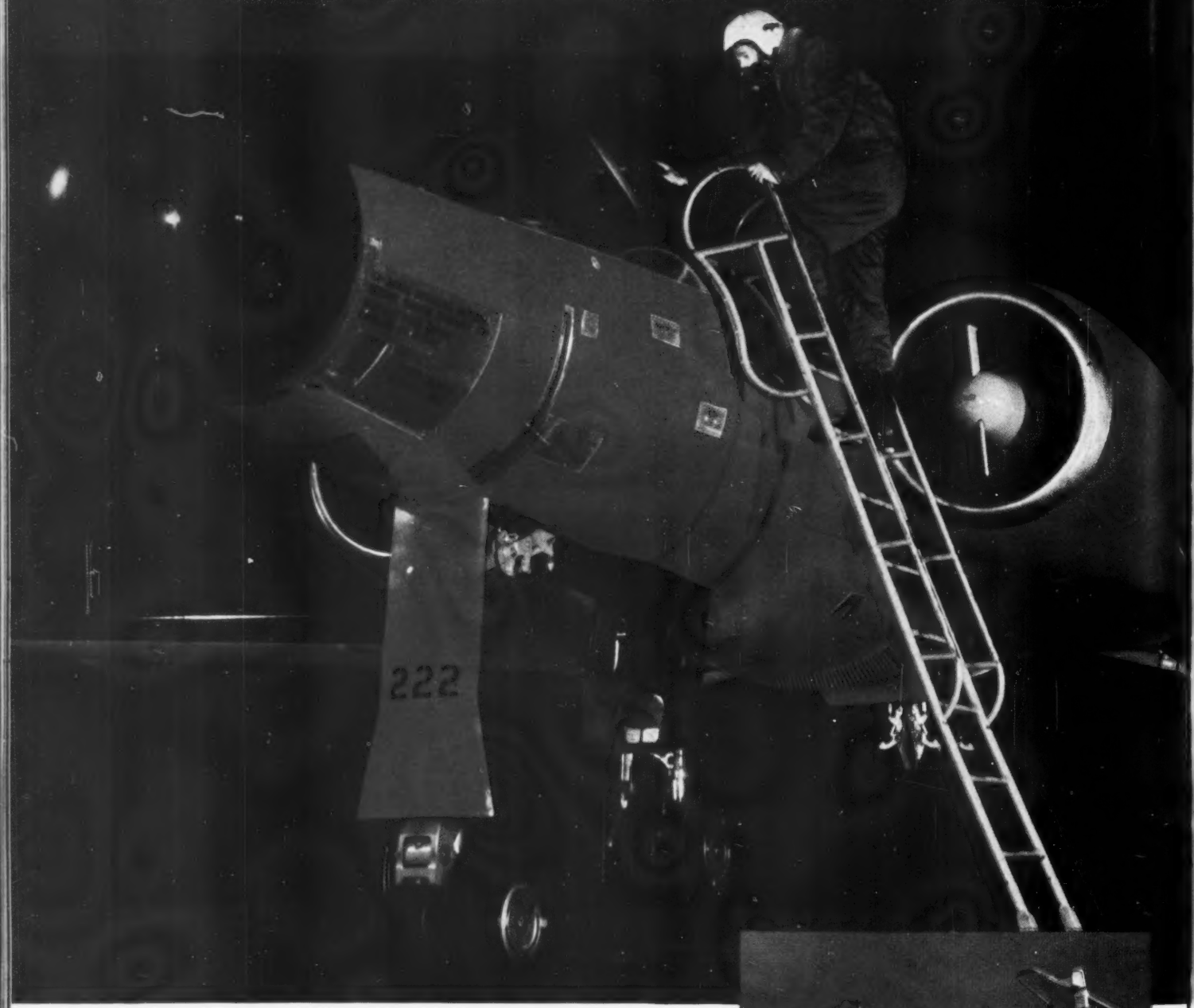


TO SAVE ARMAMENT SYSTEM DEVELOPMENT TIME, G.E.'s Aircraft Products Dept. at Johnson City, N. Y., perfected a Dynamic Accuracy Tester, DYNAT. Used with the indoor firing range, it simulates actual battle conditions, enables engineers to test systems in early stages and reduce costly air trials.

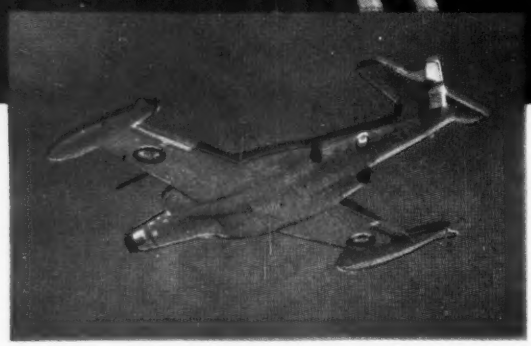


POWERFUL G-E J47 ENGINES used in SAC B-47 bombers are supported by 250 G-E field service engineers, located in 16 foreign countries as well as at 97 domestic bases. General Electric's new J79 engine, now being flight tested, will deliver even greater speed, give wider range to tomorrow's aircraft.

CONTINENTAL DEFENCE IS AVRO AIRCRAFT'S BUSINESS



In RCAF operational multi-squadron service in Canada, squadrons of CF-100s will begin duty with NATO forces in Europe by 1956



DROGUE PILOT RIDES RED

To practice collision course interception—the new one-pass radar-controlled attack technique—the RCAF needed "something fast and high to shoot at". Avro Aircraft supplied modified CF-100s which tow specially designed drogues attached to 12,000 feet of cable. The planes are painted a vivid fluorescent red so they won't be mistaken for the target.

Practicing this new collision course attack or the grim business of repelling enemy planes, Avro Aircraft's CF-100s are the mainstay of Western Hemisphere defence. Men of the RCAF patrol Canada's northern approaches on a 'round-the-clock alert in these mighty all-weather night interceptors.

Avro Aircraft's CF-100s add deadly striking force to the air defences of the free world. No other all-weather night interceptor in service today can equal them for power and range.

AVRO AIRCRAFT

AVRO AIRCRAFT LIMITED MALTON, CANADA

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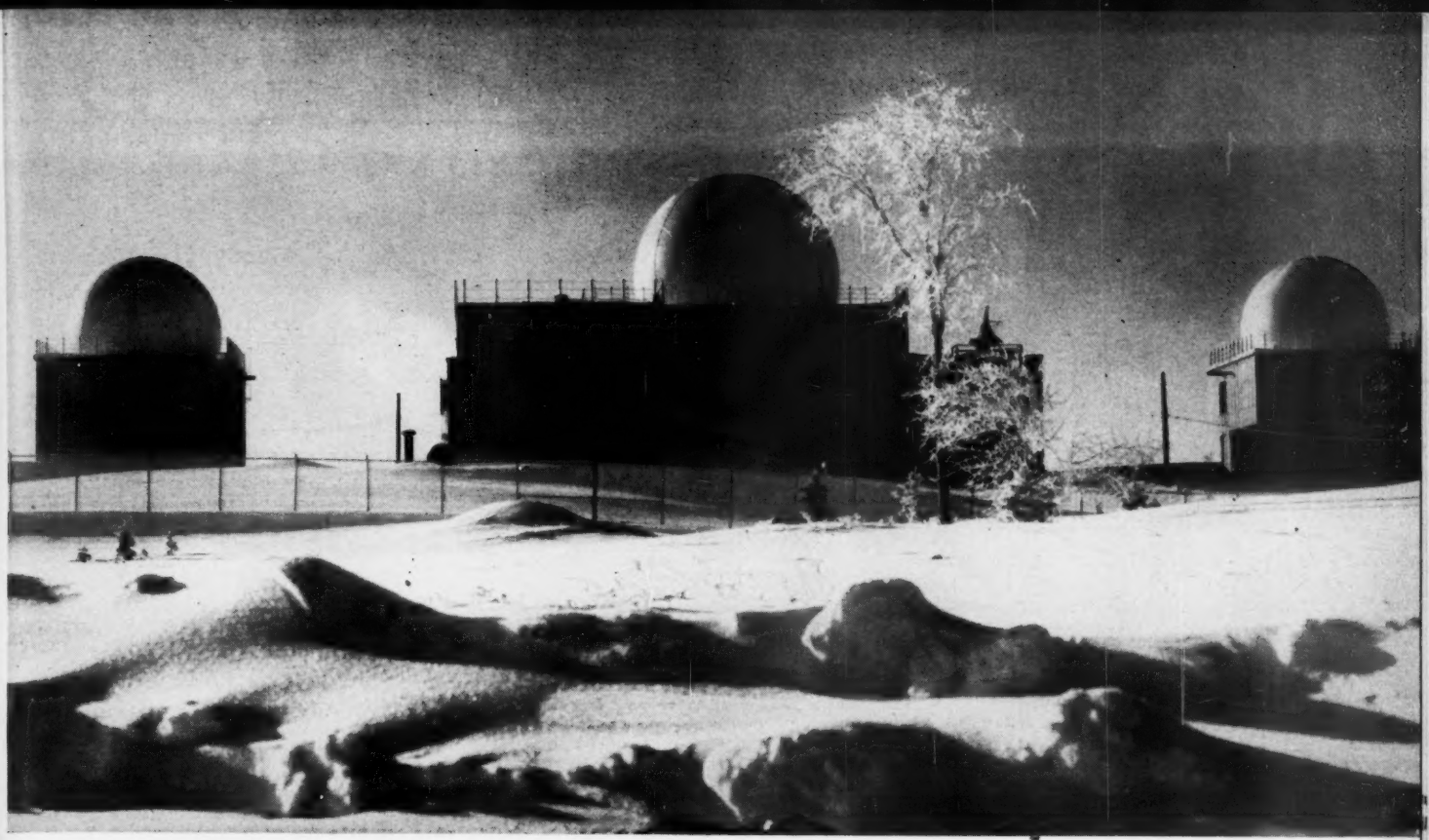

An RCAF radar station looms in a winter wilderness—one link in the electronic fence guarding our northern flank.

How we're building the world's biggest

BURGLAR ALARM

By Charles Corddry

Mr. Corddry lives near Washington, has covered aviation news on the Pentagon beat for seven of the fifteen years he's been with United Press.

ROUGHLY 1,500 miles north of the US-Canadian border, in a frigid snow-swept wilderness that even most Eskimos shun, the United States is building an electronic fence against transpolar bomber attack.

Sometime in 1958, small bands of trained civilian operators and a sprinkling of AF officers are scheduled to take up posts at dozens of stations along a 3,000-mile arc that will close the last major gap in the North American radar warning system.

The Distant Early Warning, or DEW, Line then will be fully operational—eight years, to be sure, after it began to be needed.

Work began on the mammoth construction project early in 1955, when siting and construction teams made their first forays into desolate Arctic reaches, battling snow, high winds, poor visibility, and temperatures down to fifty below.

But only this spring have persons outside the military and construction forces been admitted to the frigid wastelands for a first-hand look. Thirty-one US and Canadian newsmen toured the length of the line, in fair weather and foul, across mountains and tundra, in airplanes and snowmobiles. Within rather strict security limits, you could gather some details on construction progress and on the line's military utility and limitations.

The combination of rotating and non-rotating, or gap-filler, radar outposts stretches from Cape Lisburne, Alaska, within electronic eyesight of Russian territory, to Baffin Island's fjord-marked east coast, generally along the sixty-ninth and seventieth parallels.

As planned, the radar fence will cost at least $400 million to build, entirely financed by the United States under a November 1954 agreement with Canada. Demands for expensive modification and improvement of the warning system soon after it is completed can be forecast with reasonable certainty. Its equipment was designed more than a year ago to detect the types of jet bombers that Russia has today in growing numbers. By the time it is operational, in "approximately two years" by Air Force estimates, military men will be earnestly seeking means of dealing with much higher flying, supersonic bombers and ultimately the intercontinental ballistic missile.

The DEW line was made possible chiefly by two scientific breakthroughs. In 1952 these caused military men to begin to revise earlier pessimistic estimates of the manpower and money requiremnts and near futility of vast radar warning projects. One was the development, at Massachusetts Institute of Technology's Air Force-sponsored Lincoln Labora-

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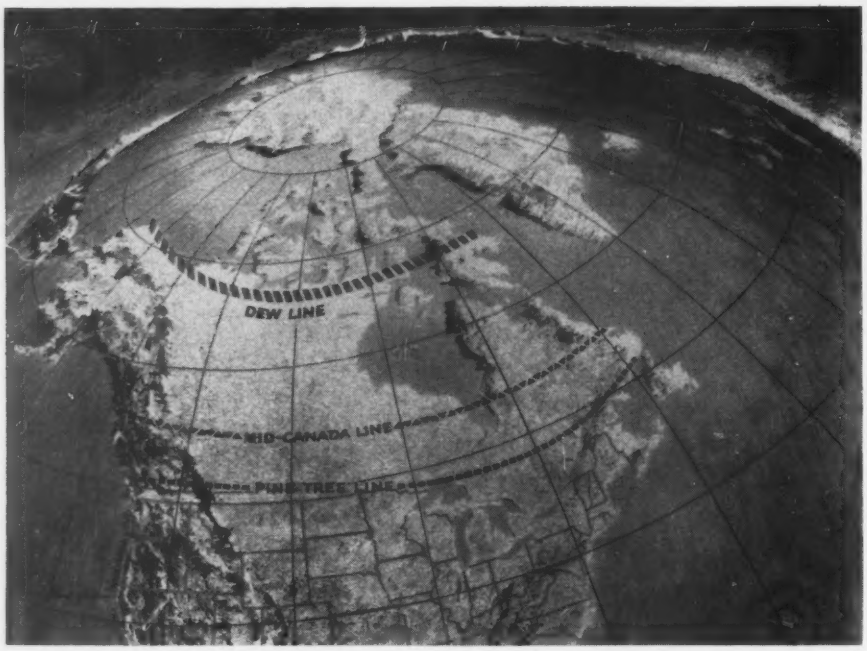

With completion of the DEW line in 1958, three radar lines will guard the US.

Construction workers drill holes for a foundation on a Baffin Island site.

A bulldozer and scraper fight rough terrain at one of the DEW line sites.

tory, of automatic alarm circuits that enable radar to give an audible alarm when a target is picked up. This meant that far fewer men would be needed to man the installations. The second breakthrough was in communications. Reliable long-range communication was assured, free of northern atmospheric interruptions, through use of VHF ionospheric and UHF tropospheric scatter propagation.

The question persistently arose, while traveling along the DEW line and visiting stations in varying degrees of completion, whether this "wonder of the world" would become in the public mind a new Maginot Line, giving a much overdrawn sense of protection. One heard the project likened to the 1,500-mile Great Wall of China, built more than 200 years B.C. to keep out northern barbarians and not always successful.

As Brig. Gen. Dale O. Smith has pointed out in discussing air defense in his book *U.S. Military Doctrine*, "It is technically feasible from the scientific standpoint . . . to kill all flies with a fly swatter; it is not tactically possible to do so." Nor are the American and Canadian air forces under any illusions that the DEW line is an impregnable defense.

Some of the pertinent facts, pro and con, which apply to the line are these:

1. There probably will be fifty to sixty, possibly more, stations of all types providing good overlapping coverage by the rotating radars and coverage of the blind spots between, down perhaps to 1,500-foot altitude, by the gap fillers. The great, plastic radomes are set atop high towers on highest terrain for maximum visibility.

2. DEW line radar, like any other, is limited to line-of-sight, can be jammed and, of course, cannot predict where a bomber is going after it is out of the radar's tracking range. Jamming, as Maj. Gen. James E. Briggs, USAF Assistant Deputy Chief of Staff for Operations, points out, is in itself a pretty good warning. All the anti-jamming devices possible are being installed, providing only that there is no delay in construction.

3. The line should provide three to

(Continued on page 80)

Air Force C-124 transports unload heavy construction equipment for the DEW line at Churchill Airport on Hudson Bay.

GREATER THAN 1200 FOOT-LAMBERTS

. . . with the New RCA-6866 5-inch Display Storage Tube

Airport surveillance radar – capable of being monitored in broad daylight.

"Freezing" transients for study in a fully lighted area.

RCA-6866 Facts

Brightness – 1750 foot-lamberts (av.)
(screen voltage, 10,000v.)
Writing Speed – 300,000 inches/sec.
Overall tube length – 15½"
Greatest bulb dia. – 5"
(excluding high-voltage cable)

RCA, a leader in display storage tube research and development, now offers equipment designers the RCA-6866—a direct-view type capable of presenting brilliant, non-flickering displays of electronic information for *as long as 60 seconds after writing stops*. The tube is capable of producing a full, 4-inch diameter display bright enough to study in a fully-lighted room. And it is capable of "writing" fast enough to "freeze" microsecond transients for a length of time adequate to examine and photograph, if desired.

In the RCA-6866, an electrostatically focused writing gun produces the electron beam which is electrostatically deflected by two sets of deflecting electrodes. A viewing gun produces the electron stream that "floods" the tube electrodes controlling the storage function—and the brightness of the tube display.

If you are working with airplane-cockpit radar-display equipment . . . fire-control radar . . . airport surveillance . . . transient studies . . . data transmission, *including half-tones* . . . or visual communications requiring steady, non-flickering, narrow-bandwidth transmission over telephone-type lines . . . by all means look into the advantages of the RCA-6866.

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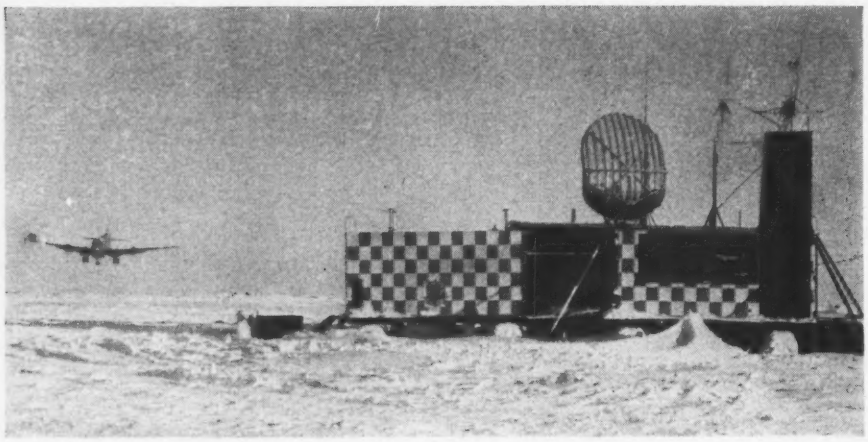
6355 East Washington Blvd.
Los Angeles 22, Calif.

For sales information on RCA-6866—and on other display storage tubes now in development at RCA—contact the RCA Office nearest you. For technical data, write RCA, Commercial Engineering, Sec. F53R, Harrison, N. J.

RADIO CORPORATION of AMERICA
ELECTRON TUBES HARRISON, N.J.



A C-124 carrying equipment for the DEW line lands on a snow-covered strip.

six hours' warning of approaching attack and thus give the Strategic Air Command a running start on retaliatory missions. By enabling civil defense agencies to get into action, the line "may save millions of lives," according to the Air Force. Data collected and sifted on the DEW line will be transmitted in a matter of minutes to Alaskan and Northeast Command defenses, US and Canadian Air Defense Commands and installations, and SAC.

4. After penetrating the DEW line, enemy bombers could be "lost" to defenders for an hour and a half or more before they are spotted crossing the Mid-Canada Line, which Canada is building along the fifty-fifth parallel. Present limitations of aircraft range may serve to forestall elaborate zigzag courses, but they must be reckoned with to some extent.

5. The DEW line, as General Briggs points out, is a warning line, not a combat line. But it is a series of Arctic outposts easily expanded if it is later determined to station or service jet fighters or interceptor missiles like the long-range Bomarc there. There are runways—both gravel and ice—hangars, maintenance and repair shops, and limited but improving navigation aids.

No one could say that the United States and Canadian governments moved with overwhelming haste in reaching agreement to build the DEW line, although construction apparently has moved as rapidly as humanly possible since the fundamental decision was taken. There were many considerations involved in the decision; but if expense was one of them, the nation has eventually wound up spending the money anyway.

General Twining, the AF Chief of Staff, said a few weeks ago that "the first nuclear explosion in Russia was a punctuation mark—signalling the end of an era of American safety by isolation." The explosion came in the late summer of 1949 and during the next year the Soviet threat became undeniable so far as airmen and many high civilian officials were concerned. In the protracted military, budgetary, and diplomatic talks that followed, it was finally decided that a radar line in the high Arctic was an urgent new defense need to provide much earlier warning than was then possible.

The Russians had some time to go before their first thermonuclear explosion. But they were stockpiling atomic bombs, had several hundred reciprocating engines, long-range bombers, and were at work on both turboprops and jets. The war came in Korea and no one knew where the Communists might strike next.

In these circumstances was born the first emphatic contradiction of the notion that there is "no defense against the A-bomb," although airmen beat off any contradiction of the real meaning of that notion; namely, that nothing must hamper the build-up of the strategic air force.

The Air Force set up Project Charles and then Project Lincoln and by late 1952 scientists associated with those projects were convinced that a distant early warning system not only was urgently required but entirely feasible. Some of the more optimistic held that such an Arctic line could be in place by 1955.

The government decided, however, to test the DEW concept and some of the "wholly new" equipment involved near Barter Island, Alaska, during 1953. Meanwhile it was agreed with Canada in October 1953 that a Mid-Canada Line was needed, under a policy of pushing the radar defenses outward from prime target areas. Later that year Canada informed the United States that it would proceed with construction of that line, while the United States undertook to extend the warning system by both air and ship on the continent's seaward flanks.

Another year went by before agreement was reached to build the DEW line, the Western Electric Company receiving its contract as prime contractor in December 1954 and getting the first construction sites open, almost miraculously, barely two months later.

Former Canadian Defense Minister Brooke Claxton, who expressed some grave reservations about the immediate seriousness of the Red transpolar threat and early need for a DEW line

(Continued on page 83)

Neither Canada nor the US has acceded to the idea, apparently held fondly by a few scientists, that some sort of almost completely impenetrable air defense could be set up, and should be, even at the expense of diminished emphasis on SAC. Be that as it may, these three scientists have made major contributions to air defense, including the DEW line. And their dedicated persistence is largely responsible for getting a far more effective air defense system built. For this, the whole country is indebted to them, as it is to the entire scientific community for many other things in this age of technological peril. They are, from left: Lloyd Berkner, president, Associated Universities, Inc.; Dr. Albert G. Hill, former director of MIT's Lincoln Laboratory; and Dr. George E. Valley, Jr., associate director of Lincoln Laboratory.

THE NET

America's most potent protective weapon has been announced by the Army.

It is the new Martin Missile Master, the country's first electronic system designed to coordinate and control an integrated network of radar surveillance, target detection and anti-aircraft missile battery operation.

Now fully proved out and ready for installation, Missile Master offers pushbutton protection for whole cities and strategic areas.

The system collects information on the position, identity and flight data of all aircraft entering the network. This data is stored electronically and distributed to display consoles in the Operation Center and at the missile batteries.

Thus, the activity of Nike batteries and other advanced weapons in the system are centrally coordinated and controlled.

This important new weapon system is one of the great defense developments of our time.

MARTIN

Cessna T-37 designed for Jet Training

To meet jet age demands, the U. S. Air Force requires a jet trainer that makes it easy for cadet-pilots to master first-line combat airplanes.

The Cessna-developed T-37 introduces the cadet to all combat jet airplane characteristics while training on this safe, easy-to-fly jet trainer.

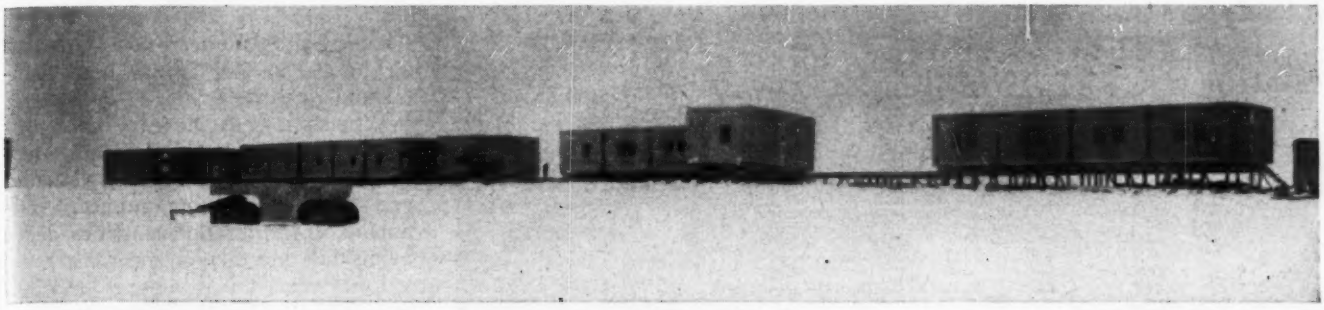
It is designed to provide the Air Force with a jet trainer that can be operated at substantial savings and cover the most important and longest phase of the cadet-pilot's jet training.

It is a privilege for us here at Cessna to team with the Air Force in its forward-thinking plans for the jet age. CESSNA AIRCRAFT COMPANY, Wichita, Kans.

Cessna®

Ready for Air Force cadet-pilots . . . Cessna T-37's.

Be an Aviation Cadet. Inquire today about the future your Air Force offers from your Air Force Recruiting Office.



DEW line's basic unit of construction is the module, a building 28 x 16 x 10 feet. Here one is unloaded from a sled.

in private conversations in the summer of 1953, expressed himself this way in a May 1954, statement to Commons:

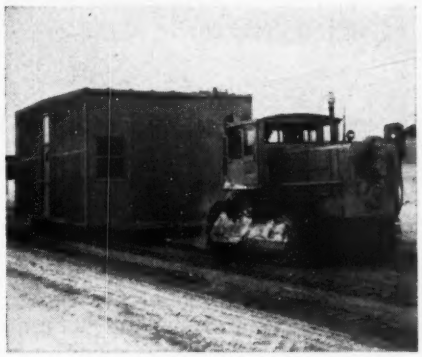
"The ability of the US to deliver the A- and H-bombs becomes a matter of the most urgent and primary importance in the preservation of peace. That ability must be protected. This consideration brings into focus and gives new emphasis to the whole question of 'continental defense.'"

The DEW line, which conceivably may be manned by as few as 1,200 civilians trained by Federal Electric Corp., an I T & T subsidiary, consists of three types of radar stations:

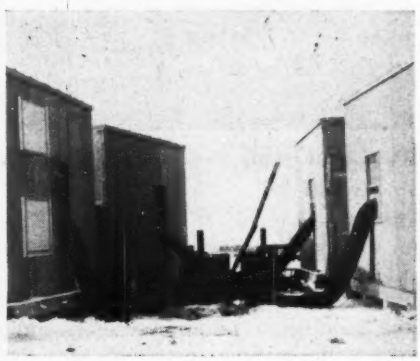
- "Main" and "Auxiliary" stations both feature rotating radar and differ only in the fact that "Main" stations are equipped for logistic support roles and will be manned by about twice the personnel of an "Auxiliary."
- "Intermediate" stations are the gap fillers, featuring an electronic fence to fill the blind spots between the other two types of station.
- At selected stations, usually "Main" ones, a half dozen or so USAF and RCAF officers will be posted to evaluate data filtered in from across the line and to see that it reaches the high echelons where decisions to commit defense forces must be made.

Newsmen visited each type of station—a gap filler on Baffin Island accessible only by air, an auxiliary in the Gulf of Boothia area northwest of Hudson Bay, and a main site on Victoria Island. They saw, too, the great supply and construction center at Point Barrow where the DEW line prefabs are assembled and moved by sled train to Alaskan sites.

From the tour it was possible to gain some appreciation of the almost incredible difficulties encountered in siting, building, and supplying a 3,000-mile-long line isolated from civilization and holding no necessary building resources except gravel. Everything else, down to the meanest necessities of life, has to be brought in by air and, during the brief two summer months of relatively open water, by sea.



A module is towed to storage area to await transportation to the DEW line.



While work goes on inside, four modules get heat at the prefab plant.

Without the airplane—the hundreds of commercial and US Eighteenth Air Force transports—this defense against the airplane could not have been built.

In the beginning, siting teams went in by ski-plane and opened camps where nothing much but the bark of the white fox and howl of the wolf was known before. The first men in—there now are more than 4,000 of many nationalities working on the line—cleared air strips, sometimes with the invaluable help of seven-ton tractors dropped by parachute. The air strips usually were carved out on lakes frozen to depths of five to six feet. On these strips, Douglas C-124 Globemasters weighing 168,000 pounds touched down and poured through their clamshell doors the twenty-ton tractors and other heavy equipment with which work could be started in earnest.

Gradually, the construction camps of insulated quonset huts, warehouses fashioned from packing crates, and plastic work tents draped over steel pipe took shape. Roads were hacked out of snow and rock to nearby heights and the permanent buildings began to arise. At one site, newsmen travelled up a five-mile road that wound steeply from the construction camp to the permanent site 1,600 feet

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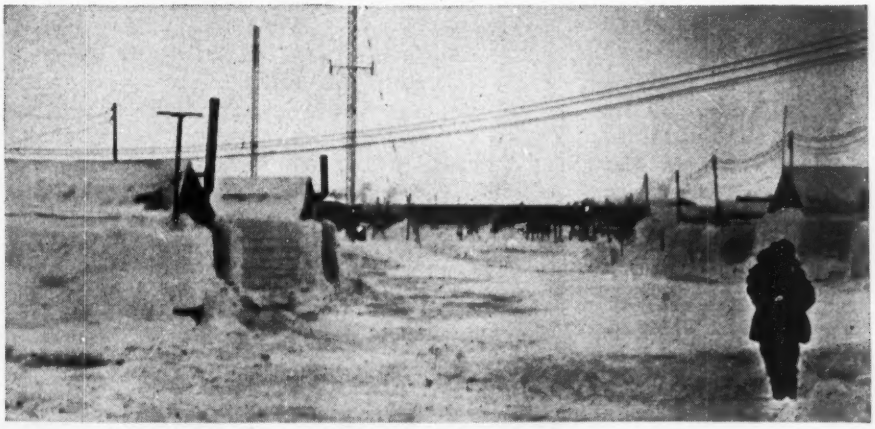
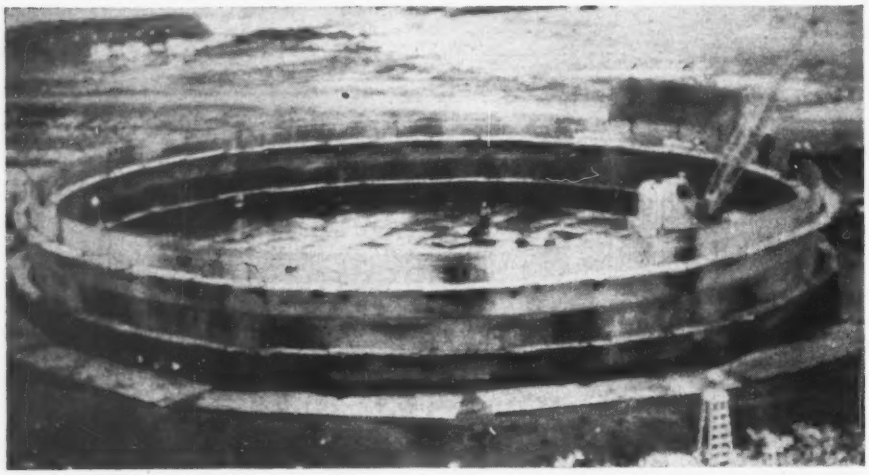


January at a distant early warning (DEW) line site. This is a typical scene of the harsh Arctic weather that the men working on the line have to endure.



Petroleum tank under construction at a DEW line site near the Arctic Circle.

above sea level. It took six months to build the road, and a ceaseless effort to keep it clear.

The basic unit of construction is the module, a building twenty-eight feet wide, sixteen feet long, and ten feet high, made of prefabricated panels. Any number of modules can be joined together in a "train" depending on the size of the site. A "Main" station comprises two 400-foot "trains" joined by an overhead bridge, an "Auxiliary" has one 400-footer, and a gap filler makes out with about a half dozen modules.

The module trains are oriented with the prevailing winds to minimize snowdrifts and are mounted on stilts or gravel pads so their heat will not thaw the permafrost beneath, causing them to settle.

Inside the trains, there are grouped the living quarters, mess, recreation and storage areas, electronic equipment rooms and power plant, heating and water storage areas. Every care has been taken to make life as pleasant as possible for the permanent parties who will man the stations in the desolate northern wastes. Facilities are provided for husband and wife teams, if it should be decided to employ them. There are libraries, small PXs, ham radio operations areas, stainless steel kitchens with electric ranges and automatic dishwashers, and private offices for the site chiefs. All surfaces are covered with fire-retardant paint, and sprinkler systems are built in, for fire is a mighty hazard in the Arctic.

On many of the sites, steel towers now are rising to be topped with the great, mushroom-like radomes which are expected to spot any transpolar attack. Soon Western Electric will begin to install the radar itself and during the long period of testing and instrumentation Federal Electric will begin to bring in for orientation the civilian crews who will man the DEW line.

Part and parcel of this "biggest Arctic operation of all time," as General Briggs calls it, is a transportation effort of immense scope, undertaken by the American and Canadian air forces, navies, armies, and commercial carriers.

When one sees the Arctic slope of Alaska, the vast, snow- and ice-covered flatlands of northern Canada, and the treacherous mountains of Baffinland, transportation statistics cease being dull and take on meaning.

Last year an estimated 181,200 weight tons (Navy figures often are given in measurement tons) moved to DEW line sites over long land, sea, and air supply routes. Of the total, 42,000 tons, or better than twenty-three percent, were airlifted by the USAF and Canadian carriers. The Eighteenth Air Force accounted for 18,000 tons itself, using Fairchild C-119 Flying Boxcars and Douglas C-124 Globemasters.

The US Navy, with a big assist at the eastern end of the line from the Canadian Navy, moved 120,000 tons into the Foxe Basin on the east and around the top of Alaska through the Beaufort Sea on the west. The remainder moved by barge, truck, and caterpillar tractor-drawn sled train, from Seattle to Fairbanks, thence over the mountains by air, down the Mackenzie River and over the snow.

"We didn't tell the pilots and airmen it was impossible so they went ahead and did it," says Maj. Gen. Chester E. McCarty, Eighteenth AF commander. Capt. R. F. Pryce of the Military Sea Transportation Service puts it this way: "The Russians must have been shocked, knowing how little we knew about the Arctic, to see 126 ships go up there and bust the Arctic wide open."

Responsibility for the construction project, which is known simply as Project 572 in official jargon, is vested in the Air Materiel Command, which took over from Air Research and Development Command in March 1955, as actual building got under way.

The Project Office, with representatives from various commands, operates side-by-side with Western Electric Co., the prime contractor, in New York. Western Electric's chief subcontractors are Puget Sound and Drake of Seattle in the Alaska sector, Northern Construction Company of Vancouver in the western Canada sector, and Foundation Company of Montreal in the eastern sector.

To newsmen surveying the immense project, Robert B. Alexander, Western Electric assistant project manager for operations, planning, and training, summed it up: "Nobody said it was going to be easy."—END

Two Eskimos travel by Air Force C-119 to a work site. Last year twenty-three percent of the supplies for the DEW line were airlifted to the sites.

Defense, too, demands specialists in computation

Speak of modern defense systems and you speak of computation—the unerring, lightning-fast kind that makes it possible to guide missiles, aim guns, locate and intercept high-speed aircraft.

To evolve this kind of computation requires specialists, *plus* a completely integrated organization for research, development, engineering and tooling . . . for precision manufacturing, testing, field service and training.

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Burroughs has consistently demonstrated its fitness to assume the prime responsibility for Armed Forces' projects involving instrumentation, control systems, communications, electronic computation and data processing. Further inquiries are welcomed. Burroughs Corporation, Detroit 32, Michigan.

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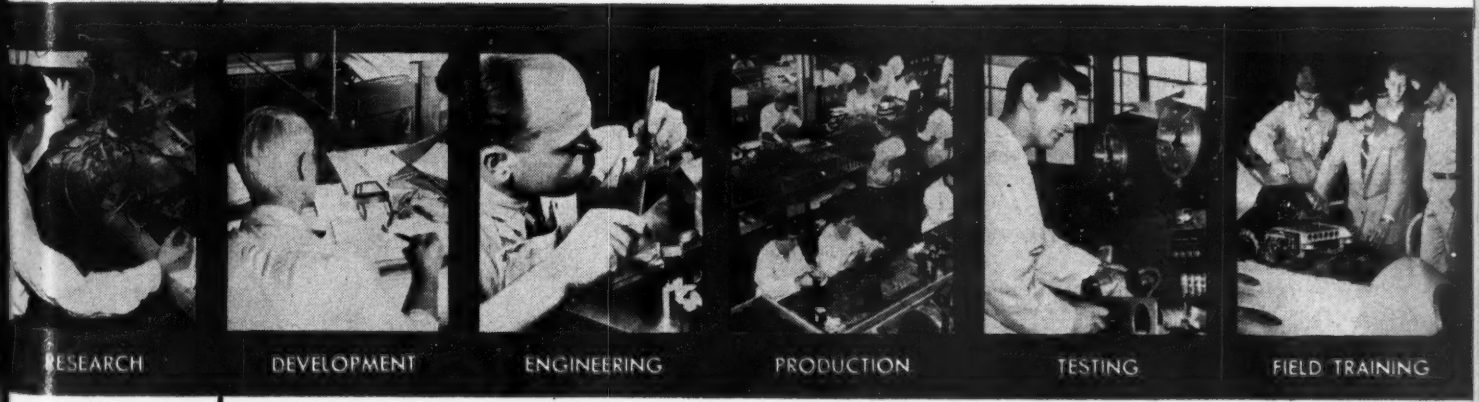

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Design, Development, Production

CASE HISTORIES

of Weber Aircraft Corporation

subject:
EJECTION SEATS FOR B-52

Weber Aircraft Corporation, 2820 Ontario Street, Burbank, California

AIR FORCE'S MIGHTIEST BOMBER EQUIPPED WITH WEBER EJECTION SEATS

Eight years in development, Boeing's B-52 is the Air Force's largest and fastest jet bomber, capable of flying a bomb load to the other side of the world and return. The giant, eight-jet, swept-wing aircraft, now in quantity production in Boeing plants at Seattle and Wichita, is equipped with Weber pilot, co-pilot and crew ejection seats.

Latest type ejection seats

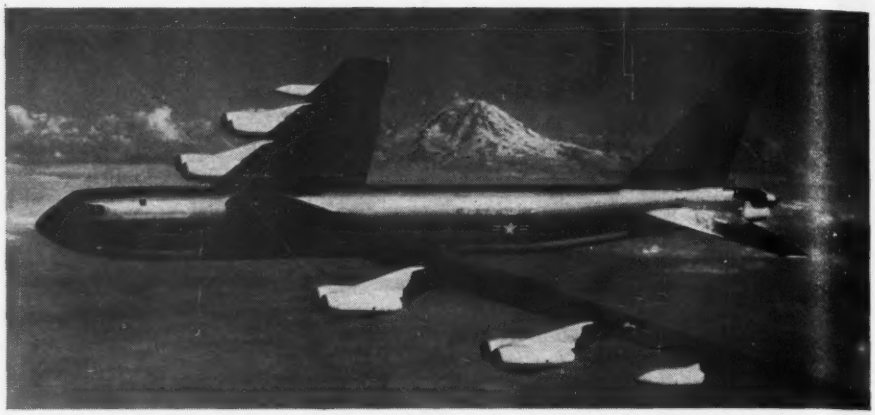
The Stratofortress, designed to be the USAF Strategic Air Command's front line heavy bombardment aircraft, has the latest type of ejection seats so that the crew member has only to pull the "go" handle to find himself floating out in space. The seats, similar to Weber seats in Boeing's 6-jet B-47 medium bomber, feature extensive use of aluminum forgings for extra rigidity and light weight. An electro-mechanical actuating device makes seat adjustment quick and simple. Stowable arm rests can be folded down out of the way to provide extra arm space. Foot rests provide additional safety.

Static and functional tests

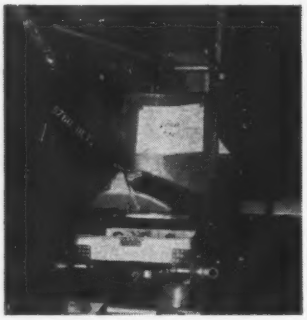
During the prototype phase, the seats were put through intensive static and functional tests at the Weber test facility and firing range. In production, they are the subject of meticulous quality control. Each seat is checked out under simulated ejection conditions before delivery. Every electrical and mechanical function is carefully tested on special stands.

Weber participates in accelerated program

Weber is proud to be one of the manufacturers selected to participate in the accelerated B-52 program. Weber also manufactures the forward crew floor and nose assemblies as a sub-contractor to Boeing Wichita.

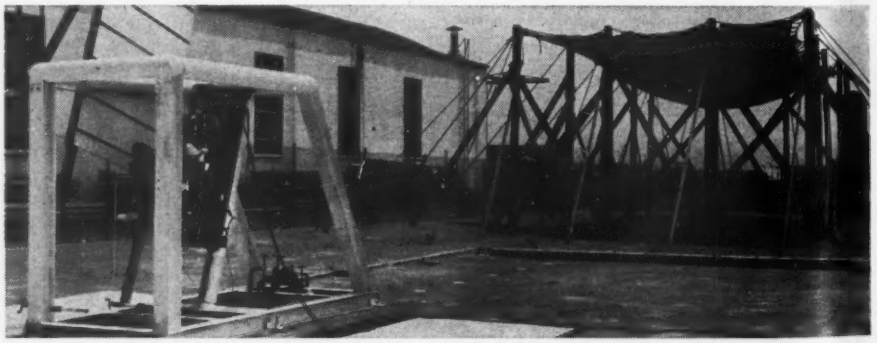


Eight Pratt & Whitney J57 jet engines develop approximately 100,000 pounds of thrust to propel the Boeing B-52 Stratofortress at more than 650 miles per hour.



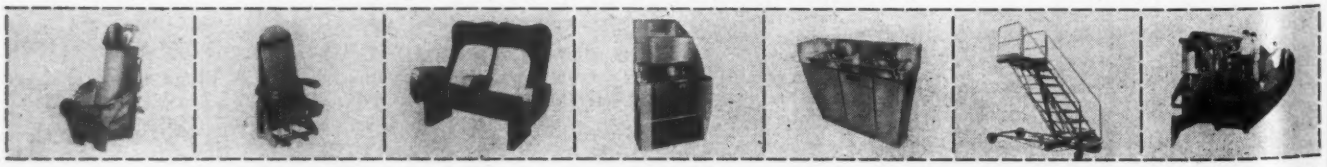
Pilot, co-pilot and crew seats designed and produced by Weber feature aluminum forgings developed for optimum weight/strength ratio.

George Robinson, Weber sales engineer, and Arnold Johnson, Weber vice-president, meet with Boeing's Glen Mills at Wichita, Kansas, to witness the roll-out of the first Wichita-built B-52D, which is equipped with Weber ejection seats.



At the Weber test facility in Burbank, a B-52 ejection seat is subjected to instrumented operational tests, one phase of Weber's intensive test program.

Manufacturers of:
Ejection Seats / Pilot and Crew Seats / Passenger Seats / Buffets, Wash Basins and Other Interior Equipment / Aerostands / Airframe Sub-assemblies

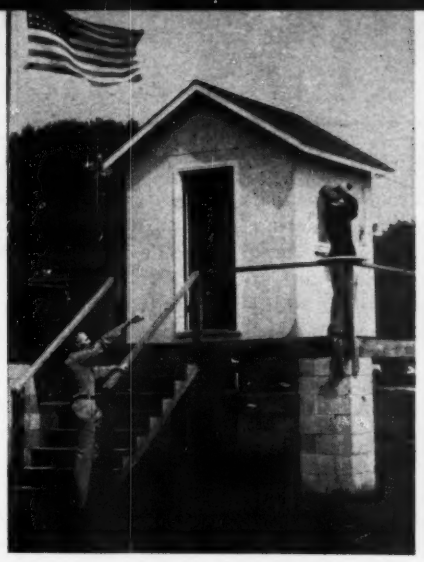


WEBER AIRCRAFT CORPORATION, 2820 ONTARIO STREET, BURBANK, CALIFORNIA

On watch with the

GROUND OBSERVER CORPS

By Col. Barney Oldfield



The job civilian volunteers do as ground observers is tough but vital.

SWALLOWED up in a storm on a cross-country flight while heading for Port Columbus, Ohio, Marine Corps 2d Lt. David L. Smith was getting low on fuel, and his navigational aids were out. A reformatory guard named Frank Shoemaker, of Marion, Ohio, heard the plane circling overhead and guessed that it was lost. He called the Air Defense Filter Center in Columbus. It, in turn, phoned the nearby radar site at Bellefontaine, Ohio, which instructed Smith to put his AD-5 Douglas Skyraider in a triangle pattern. Radar picked him up and brought him in safely.

In the President Hotel in Palo Alto, Calif., a man named H. D. Johnson spotted a fire started by a cigarette that had dropped in a mattress. He doused it with a fire extinguisher before the fire could get out of hand.

And in Joliet, Mont., from a rooftop vantage point a farmer-rancher named Boyd McBride saw some yeggs prying the lock on a door in the middle of the night. McBride's call to the cops sent the culprits flying.

All of these things and more—representing saving of millions of dollars, assisting aircraft in trouble, saving lives, property, and helping in community safety measures—are extra dividends, the extras our country gets from having a dedicated body of civilian volunteer plane-spotters called the Ground Observer Corps.

The Ground Observer Corps is admittedly a stop-gap organization. It uses human eyes and ears for detection duty, to complement our severely limited radar capability which had to start from scratch in 1948. At that time, Congress realized the danger of enemy air attack and appropriated nearly $300 million dollars to buy and install a preliminary band of radar installations. But the line-of-sight nature of radar, and the wide gaps in the electronic fence, meant that an augmentation force was needed—one with a low-altitude capacity to report aircraft by type, direction, and speed.

So in 1952, on July 14, in an unprecedented peacetime volunteer effort, more than half the nation went on Operation Skywatch, round-the-clock twenty-four-hour duty. Now fully five-sixths of the country is on Skywatch, with 16,000 posts and seventy-three filter centers to handle the mass of air traffic and other information.

During this time the Continental Air Defense system has been building more radar sites, locating gap-filler subsidiaries to it, and installing the Distant Early Warning (DEW) line in the Arctic and mid-Canada sites. ConAD, acknowledging the importance of the GOC, has allocated 509 officers and 1,641 airmen to its Ground Observer Corps detachments. Theirs is primarily the function of administration and operational training, but they have shouldered a major portion of the recruiting effort as well.

The annual phone bill for communications for the Ground Observer Corps reporting runs to $5.5 million. The investment in vehicles and special equipment by the Continental Air Defense Command is another $5.7 million, and filter center rentals runs to $603,000 annually—testimony to the ConAD belief in the interim value of GOC until the DEW, mid-Canada, and other radar lines are in, and the SAGE *(see page 58)* system is hooked up.

In the most recent full-scale exercise in which SAC's bombers were thrown in strength against the air defense system, two Ground Observer reports from points 500 miles apart in the Canadian northwest gave more than four hours' warning of the impending attack.

In other exercises, Ground Observers spotted mass formations breaking up to hit various target systems in this country. Their valuable information made it possible to alert interceptors well before the bomb-release line was reached.

There is no tougher duty than that of the Ground Observer, when you consider the tiresome hours, the loneliness of many of the watches, and the scorn, derision, or just plain apathy shown by their neighbors.

Until recently, it appeared that Skywatch was interminable, that anyone who got in the Ground Observer Corps program was committed as a volunteer until carted off to the family plot in the cemetery. But Gen. Earle E. Partridge, ConAD's Commander-in-Chief, now has outlined the critical time period for Skywatch, indicating reduction of the effort around 1960.

"As for the future of the Ground Observer Corps," General Partridge told the State Civil Defense Directors recently, "you have perhaps seen some items in the press saying that now the GOC is no longer needed. This isn't so. We need the Ground Observer Corps and need it badly. The guided missile is not yet with us. In spite of the fact that we have set up our GOC on the basis that they will see or hear aircraft, the situation has not changed sufficiently to allow us to put the GOC on a standby basis.

"The threat is changing. We need two things we do not now have. We need to complete the Distant Early Warning Line. When it is completed we will have relatively good assurance of early warning. The other factor is the matter of low-altitude radar coverage. We are buying and installing in Canada and the US low-altitude radars, and when these are installed and hooked up to our SAGE direction centers, it will be possible for us to relax somewhat in the GOC—sometime toward the end of the '50s; maybe 1960. In the meantime, we need the GOC."

The anonymity with which these people serve was once touched upon by ConAD's first Commander-in-Chief, Gen. Benjamin W. Chidlaw, now retired, who referred to how history has all but forgotten Robert Newman, the man who hung the two lanterns in Old North Church in Boston to get Paul Revere started.

"Every weapons system," said General Chidlaw, "must have a trigger, and some Ground Observer might be the man to trigger that whole weapons system."

And the Continental Air Defense Command still looks to and depends in part on these men and women of all ages at 16,000 of the posts or "triggers" until 1961—every minute of every day and every night.—END

into the airpower act through its long-range missile program. Now, in another field the Army sees a traditional task slipping from its grasp and is shrewdly translating anti-aircraft artillery function into guided missiles. Their argument against Air Force use of Talos is a big step in this direction. We can also expect that the Nike program and plans for newer Nike-type weapons will continue to conflict with other air defense developments, such as Bomarc, an even longer-range missile. Actually the attempt to write off Talos as an invasion of an Army mission is based on an assumption of functions that do not exist and have never existed in the past ten years.

Thus the Air Force has two points of conflict with the Army in the air defense field. The first is the creation of an Army air defense empire which not only overlaps, but duplicates and interferes with the Air Force program. This is bad. Even worse is the fact that the weapon with which the Army is implementing its program has questionable value. If Nike were of proven value, the Air Force would welcome it into its air defense inventory, just as it plans to do with the Navy-developed Talos.

One cannot blink the fact that the Air Force has the sole responsibility for air defense of the continental United States. The other services have responsibility for providing forces for this purpose but the success or failure of our air defense rests squarely on Air Force shoulders.

Responsibility is a meaningful word. It carries a heavy burden in any field of activity. Nowhere is the burden heavier than in the defense of our way of life. It can be borne confidently only if those responsible are allowed to exercise their own best judgment, based on years of experience, in selecting the tools and organization with which to do the job. This is why the Air Force has reason to be concerned about the Army's ambitions for Nike. It is an untried weapon and, according to Senator Dennis Chavez (D., N. Mex.), Chairman of the Senate Military subcommittee examining the situation, it is a costly weapon in manpower and resources.

Worst of all, it could be inducing a false sense of security in the people of this country who, if Nike is a failure, can only point the finger of responsibility at the Air Force. Responsibility again.

Using its function of "anti-aircraft defense" to mask its intentions, the Army is moving rapidly and unilaterally into the air defense picture—not only in the United States but all over the world. This is being done without so much as a by-your-leave to the Air Force and with almost complete disregard of how to accomplish the air defense mission best and most cheaply. The Army is reportedly planning to put Nike batteries into the Caribbean area, for example, even though there is no existing control and warning system for locating and identifying enemy aircraft in that area. The same thing will doubtless happen in other US command areas across the world. In effect, the Army is saying, "Forget the Key West Agreement. We want guided missiles."

And, just as in the case of the ballistic missile, the Army's eagerness to get into the airpower picture is causing it to neglect fields in which a true Army responsibility exists.

Preoccupied with Nike, on the basis that a bird in the hand is worth two almost anywhere else, Army development of defense against low-level attack is being subordinated. Thus, defense of air bases and other installations against low-flying aircraft, a real worry in itself, is being neglected. The Army is ineffectually trying to lock the upstairs windows, while the ground floor is left open to prowlers.

Moreover, the Army, on its own again, wants a greatly expanded Nike program in the United States. It wants more Nike battalions everywhere, including reinforcement of existing sites. This would not only be costly, but it would create other problems. For with this augmentation of Nike weapons, would come a requirement for an expanded electronic control system needed to make the multiple Nike work.

The Air Force is already well under way with a more comprehensive electronic system—SAGE (*see page* 78). The first SAGE unit is now being installed. Expansion of an exclusively Nike control system is an obvious duplication of functions that SAGE can perform. It involves millions of dollars. And it can serve only Nike. On the other hand, SAGE is designed to serve all defensive weapons—interceptors and long-range missiles, as well as the short-range Nike. This is undoubtedly what Senator Chavez had in mind when he talked about Nike manpower and money costs.

All of this would be bad enough if the Nike could shoot down enemy bombers. If it were a weapon of proven effectiveness, these problems, including service responsibilities, could be straightened out through strong action in the Defense Department and the National Security Council. The fact is that no one knows how effective Nike is. The Army apparently doesn't want to find out and the Air Force hasn't been able to.

The Air Force gave careful consideration to the Nike approach to air defense many years ago and dropped out of the program in 1945, on the ground that (1) it was too costly in men and materiel to operate; (2) it couldn't hit what it was shooting at; and (3) simple countermeasures, like tinfoil chaff, quickly caused its nervous system to suffer a breakdown.

The Air Force, looking ahead to the day when the enemy would have supersonic bombers, and the capability of launching air-to-ground missiles hundreds of miles out from the target, didn't like the short range of Nike.

The Air Force wants to make sure that all weapons systems that are to be counted on for air defense are combat worthy and enable the Air Force to progressively meet the enemy weapons of the future. It is aiming for an integrated air defense system that includes the DEW Line, Mid-Canada line, the Pinetree system on our northern border, early warning in the air and at sea, the Ground Observer Corps, a communications network plus interceptors and missiles. The Air Force cannot afford to ignore the threat of 600-mile-per-hour, high-altitude bombers, nor can it be expected to endorse programs that pour too much into last-ditch defenses. The Air Force needs weapons that provide defense in depth, with a high kill rate that will destroy attackers while they are still well out from vital target areas. It cannot condone duplication or waste so long as it has the primary responsibility in the air defense field.

We hope that the weapons to be chosen for air defense will be subjected to the modern and practical tests called for by Senator Stennis. The Air Force is certainly posing no objection to this approach. In fact, Secretary Quarles has strongly endorsed the idea of testing *all* weapons extensively, before putting them into the system. Both Nike and Talos are still untested weapons in this sense.

Certainly, the people deserve resolution of these matters. They have every right to expect the military to come forth with a common concept of how defense is to be conducted.

Until controversies like the Nike squabble have been ironed out it is impossible to promise the people of the United States the protection they really deserve and believe their tax Dollars are buying.—END

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How Air Defense Is Part of the Great Deterrent

By Maj. Gen. Frederic H. Smith, Jr.

TO APPROACH the subject of maintaining the peace of the world from the standpoint of the air defense of the United States, I can choose no better starting point than to say that I am certain that a purely defensive system alone would never be the one single force which would deter a Communist decision to strike us.

We must maintain our long-range striking forces and those other forces that are capable of striking at the heartland of any aggressor. And they must be kept at the highest levels of efficiency and size to do their job, once their mission is ordered.

But, I'm just as certain that a major deterring factor lies in our being able to guarantee that our striking forces will not be caught on their bases. Any decision on the part of an aggressor to attack us if he has little or no opportunity to destroy our striking forces on the ground must be born of sheer desperation.

We know the Communist doctrine for over a hundred years has presented an unaltered intention to achieve world domination. The history of the Soviet Union since the fall of the Russian monarchy furnishes us with unimpeachable evidence of her determination to reach that goal.

And today the Soviet Union has the capability to attack us through the air with weapons of mass destruction, weapons which, if delivered without interference, could, in a single series of coordinated blows, destroy our industry, immobilize our military forces, and emasculate our will to resist.

The threat does exist; it is here. Conceding this fact, and since it could be national suicide not to prepare to defend ourselves, it behooves us to provide those measures of defense, those measures of necessary "interference" to such an atomic attack.

First, and not necessarily in order, we must provide sufficient warning and protection for our offensive striking forces to insure that the initial enemy mass attack or series of attacks will not reduce to an ineffective level our own capability to deliver devastating counterblows. For it is dead certainty that no defense system, no matter what degree of effectiveness we ultimately attain, can, alone, bring victory.

Secondly, our air defense system must provide sufficient protection for the nation's economy—its industries—to assure sustained support for military and industrial warfare.

Finally, our system must provide sufficient protection for the people of this nation to assure their physical and psychological ability to carry on in the operation of our industrial and our military machines. We could possibly lose a war by default should fear or panic destroy the national will and determination of our people to carry out a war to the enemy at all costs, regardless of the nation's military posture or industrial potential at any given time.

These measures increase in importance when we consider that we afford a potential aggressor an initial advantage of surprise because of our national sense of morality and our national tradition for never having struck the first blow. However, we believe that the Soviet Union may never make a successful attack—or any kind of an attack—so long as the United States keeps up its guard and, above all, its ability to strike back. A strong, alert air defense, by its very existence, can help to preserve both the peace and the United States.

So, we have been building, and must continue to build, a stronger air defense system to provide the best possible protection from air attack, protection of our people, our cities, our industry, and the strategic airpower of the nation.

This is the way our national defense policy has matured into strong dependence upon retaliation, and upon air defense, and concentration upon making these forces adequate and qualitatively superior to anything they might face.

Although we realize that our air offensive and defensive systems must be within the economic capability of the nation to build and maintain, we should take into consideration the question "How much air defense can we afford to be without?", as well as "How much air defense can this country afford?"

I cannot answer the last question, but I can give you a lead to the answer to the question of how much air defense we can afford to be without.

We know that the Russians have the ability to attack us by air with nuclear weapons if they wish to do so.

They have very high-flying, very long-range jets and turboprop bombers, the latter with longer range than anything we have at present.

Remember that she could lose ninety percent of a striking force of 1,000 bombers and still wipe out one-half of the population of the United States.

In light of this possibility, it is incumbent upon the

General Smith, who is now up for three-star rank and scheduled to take over command of the Fifth Air Force in Korea this month, is well qualified to speak on air defense matters. Before moving to his new assignment, he had been Vice Commander of the Air Defense Command since 1952. In this capacity he served with Generals Chidlaw and Partridge during the period when the command was having its growing pains. Born at Fort Monroe, Va., in 1908, General Smith was graduated from West Point in 1929. After flying school, he served as an instructor at Kelly Field, Tex., before a tour from 1936-39 as Senior Aeronautical Inspector for the Panama Canal, just before World War II. In 1940 he became CO of the Eighth Pursuit Group, and two years later served as group CO of the Eighth Fighter Group, Fifth AF, in the Southwest Pacific. After two years of combat service, he was transferred to the ETO but soon returned to the Pacific to direct the Fifth Fighter Command's increasing air attacks on Japan. After the war he became Chief of Staff of the newly organized SAC, and in 1947 became National Commander of the Civil Air Patrol. He was Commanding General of the Eastern Air Defense Force, Mitchel AFB, N. Y., before moving to his assignment as Vice Commander of ADC in March '52.

General Smith

United States to prepare the best air defense possible. The problem is vast; we have to be prepared at many points to fight once or repeatedly. Dollarwise, it is a matter of billions.

It is important to understand also that the kind of equipment needed in air defense is subject to rapid obsolescence due to the high rate of technological advance in the threat. The improvement of the system is geared to the availability of suitable equipment and to the capacity of our forces to use this equipment.

Another significant problem which faces our command today is the retention of our trained people. We are greatly concerned about the situation because of the impact it has on our effectiveness and also because we cannot at this time predict any appreciable change in the present trend. The Air Defense Command is not unique in this respect when compared with other commands in the Air Force, but it does have certain peculiar characteristics.

The nature of the air defense mission, for example, dictates a constant readiness twenty-four hours a day on a seven-day-a-week basis. Geographically it requires that our units be spread over the whole of the United States and certain parts of Canada, with their location determined on the basis of military necessity, technical requirements, and defense capability rather than with regard to favorable climatic and living conditions.

The net result is that by and large our people are assigned to shift duty in units situated considerable distances from large Air Force installations and also from civilian communities where normal services and conveniences can be made available. For instance, eighty-five percent of our aircraft control and warning radar units are located from a minimum of twenty miles to a maximum of 485 miles from their parent organization. To a lesser degree they are isolated from even the most rural communities in the more thinly populated areas of the country.

The people who man these organizations face much the same situation here as they do at isolated overseas areas. It is upon these people that the problems of housing, medical care, high rents, etc., have particular impact.

The technical requirements of the mission assigned this command have a distinct bearing on the problem. First, the extremely complicated equipment we must use requires us to train people for a considerable part of their service in skills which are in demand in civilian industries.

Secondly, use of this equipment to maximum capability requires such undesirable practices from a personnel standpoint as the positioning of radar units on mountain tops. For operational reasons, it has been necessary to restrict defense coverages of the northern, cold-weather areas to specific types of fighter units.

Until recently, therefore, we had a situation whereby certain of our combat teams and their support personnel were limited to service in the northern area of this country and at far-reaching air defense complexes in Alaska, Canada, Newfoundland, and Iceland.

The above generalities have a cumulative and negative effect on the career intentions of our people, and I think specific examples of this situation are appropriate.

The fire control systems mechanic is an airman who maintains electronic components of the armament systems in our fighter aircraft. We are authorized over 2,000 of these men and have a reenlistment rate of only twenty percent in this category. We have now, and anticipate for some time, a manning of only twelve percent in the technician level of skill in this specialty. We are authorized some 2,000 radar repair mechanics on our aircraft control and warning systems but have only a seventeen percent reenlistment rate and only twenty-six percent manning in the technician category.

The officer picture is illustrated by our situation in the men who make up the air and ground components of our operational team. We are short fighter pilots and of those now on hand, 661 become eligible for separation during the calendar year 1956. Based on our past experience only 152 of this number, or twenty-three percent, will extend their tours of active duty. We also have a critical shortage in the controller category. Furthermore, of the controllers now assigned, over 400 become eligible for separation during 1956, and of this number, only ten percent are expected to extend their active-duty tours.

Until recently, controllers felt they were in a limited career as far as advancement opportunities were concerned.

The loss of our skilled people constitutes a tremendous handicap and, although we receive replacements for those people who leave the service, we are constantly faced with the problem of a lack of skill and experience.

I can assure you that we are taking every internal action we can devise to increase the attractiveness of the serv-

(Continued on page 93)

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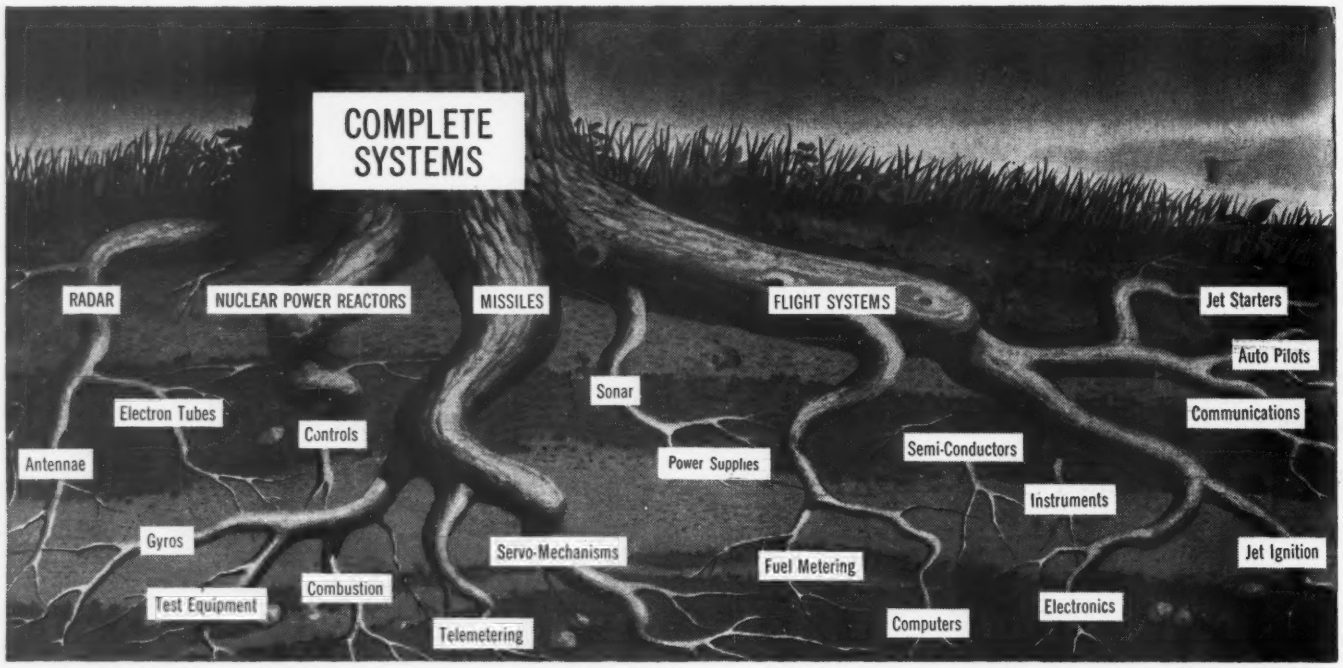

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ice career and to retain our people. The simple fact remains that our people do not find the monetary *renumeration* or the other tangible benefits which are apparently available in other fields of endeavor.

We are convinced that only by providing our people with the pay, housing, medical care, survivor benefits, and the like, will we be able to compete with the present civilian economy in retaining the men necessary for adequate defense of this country.

Despite these problems we have been steadily improving our capabilities. Our fighter units are now equipped with all-weather jet interceptors and we are activating new units. The radar nets around the United States and in southern Canada are operational. The Canadian government is progressing with the new mid-Canadian defense line, and construction of the Distant Early Warning line from Alaska across northern Canada to Greenland is progressing satisfactorily. We are also extending our radar coverage offshore on both coasts with Texas Towers, picket ships, and airborne early warning aircraft.

In addition, newer and better fighter interceptors and missiles are coming into being at a steady rate. Two of these improvements are the air-to-air guided missiles and the development of supersonic all-weather interceptors. We believe that it is not enough that enemy bombers with loads of nuclear weapons be intercepted a few miles from their targets. The extension of our intercept capability by the use of airborne early warning and control aircraft, long-range interceptor aircraft, and missiles are all designed to intercept attacking forces at greater ranges. We are also improving our control and communications equipment by introducing newly developed electronic equipment to give us new techniques and capacity to deal with larger attacking forces.

In the future we will have pilotless interceptors and nuclear weapons applications to continental air defense.

While our air defense is already formidable, we must devote our efforts to a steadily improving air defense system phased to cope with growing Soviet capabilities and make maximum feasible use of new weapons and techniques as quickly as they are developed.

In this way we can exert, at all times, an operational threat which can limit the enemy's freedom of choice and provide, together with our striking forces, the deterrent factor that will enable the communities of the Free World to remain secure forever.—END

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AFA Council meets to ask . . .

Which Way Is The Air Guard Going?

Some of the members of AFA's thirteen-man Air National Guard Council emerge from the bus for briefing at ADC headquarters, Colorado Springs, before Council meeting.

By Edmund F. Hogan
RESERVE AFFAIRS EDITOR

THE AIR National Guard is composed of eighty-seven tactical squadrons and a variety of support units, including aircraft control and warning stations. But the Guard's great strength reposes for the most part in the eighty-seven squadrons, which are distributed throughout the nation, in Puerto Rico, Alaska, and Hawaii.

Of the eighty-seven squadrons, seventy have an air defense mission. In plain terms this means that the bulk of the Air Guard constitutes a fighter-interceptor force that would be integrated within Air Defense Command immediately in the event of attack on this country.

Modern interceptor doctrine dictates the ability to fly and fight any time of day or night and in any kind of weather. The doctrine can be satisfied only through the means of highly complex equipment, a fact that preordains the need for technicians skilled in the latest electronic devices.

Until the Korean war the Air Guard had no all-weather role. In fact, it had no all-weather equipment. But since the Guard returned from service in the Korean war it has moved consistently closer, by stages, to Air Defense Command and all of the problems inherent in that command's responsibility to ward off air attack on the United States.

As the Air Defense Command equipment inventory has continued to become more complex, many thinking Air Guardsmen have pondered the future role of their component. As presently constituted, a force primarily of civilian airmen, can the Guard continue to perform effectively an interceptor mission in the modern sense of the term?

Such a group is the Air National Guard Council of the Air Force Association, which met last month in Colorado Springs, headquarters of Air Defense Command, to consider the future of the Air Guard in the light of manned equipment which grows more complex and which eventually may give way to missiles of even greater complexity.

In calling the meeting of the thirteen-member council, Chairman Alfred C. Schwab, Jr., of St. Paul, Minn., proposed that "we study the future of the Air National Guard in an effort to anticipate problems that are already arising in three areas: The mission, the equipment, and the technical training of Air Guardsmen."

The chairman laid down these terms of reference:

1. **Mission.** Considering the fundamental civilian-airman nature of the Air Guard—completely apart from the influence of equipment as currently allocated, manning tables and organizational structures imposed, and obligatory training requirements—what is the *ideal* mission for a *civilian-manned* military air organization today and in the future?

2. **Equipment.** Is the Air Guard, as a strictly civilian-airman organization, capable of assuming the full support and operational responsibilities to maintain and operate effectively and economically, aircraft of the Century Series as they are developing? Or is there a less complex type of weapon that will not raise these problems and will fill a needed function in the war plan?

3. **Personnel.** What level of technical skill can be expected of a "part-time" mechanic or pilot in relation to the complex electronic brain-type aircraft, power plants, and fire control systems which are developing?

The meeting had historic significance in that it marked the first time a group of Air Guardsmen had convened to undertake an assessment of their own future and had considered the concepts of today that become the facts of tomorrow.

At the moment seventeen Air Guard squadrons augment Air Defense Command's alert program. In this program, which has been in effect for some eighteen months, two aircraft are on five-minute alert at the end of the runway ready to make intercepts in the same manner as regular units of Air Defense Command. The Guard has experienced no difficulty in performing this job satisfactorily.

But equipment that will fly higher and faster, lock on targets electronically, and fire missiles instead of bullets is in the offing. Next month, in fact, the Air Guard will receive its first squadron of F-86D aircraft which, although obsolescent, should serve as a test bed to determine the degree of electronics maintenance capability in the Air Guard as it presently exists.

There are a number of Air Guardsmen who feel that the Air Guard can move effectively into the Century Series of aircraft—and beyond—only if there is a substantial increase in the number of permanent party people. If this is true, it will mean not only a big boost in the Air Guard budget, but it will change the Guard from a basic force of civilian airmen to full-time airmen.

But both situations could occur if one considers that for the F-86D alone Air Defense Command finds twenty hours per month the minimum for a pilot to be combat effective. There are few Guard pilots, not members of the full-time

(Continued on page 97)

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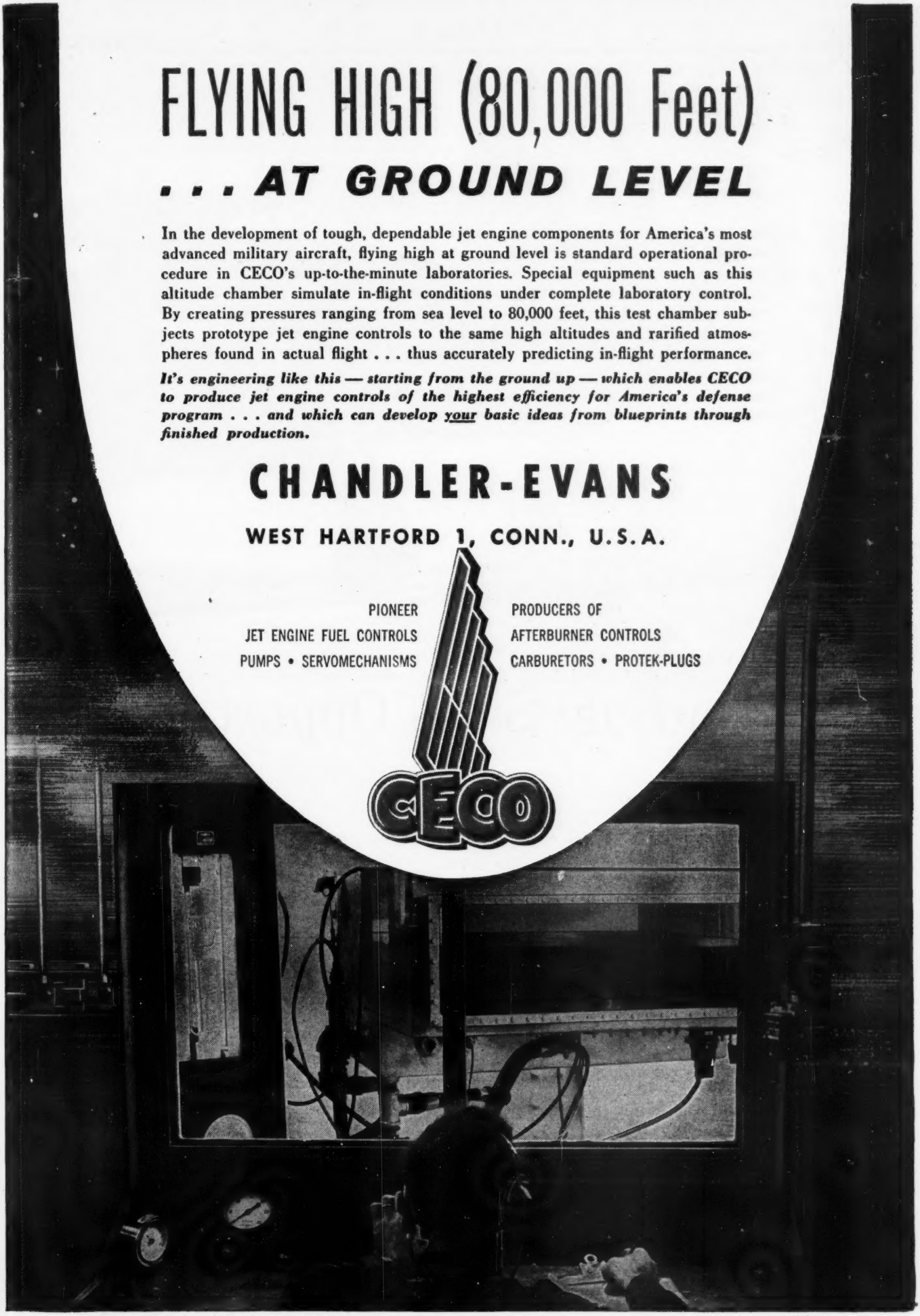

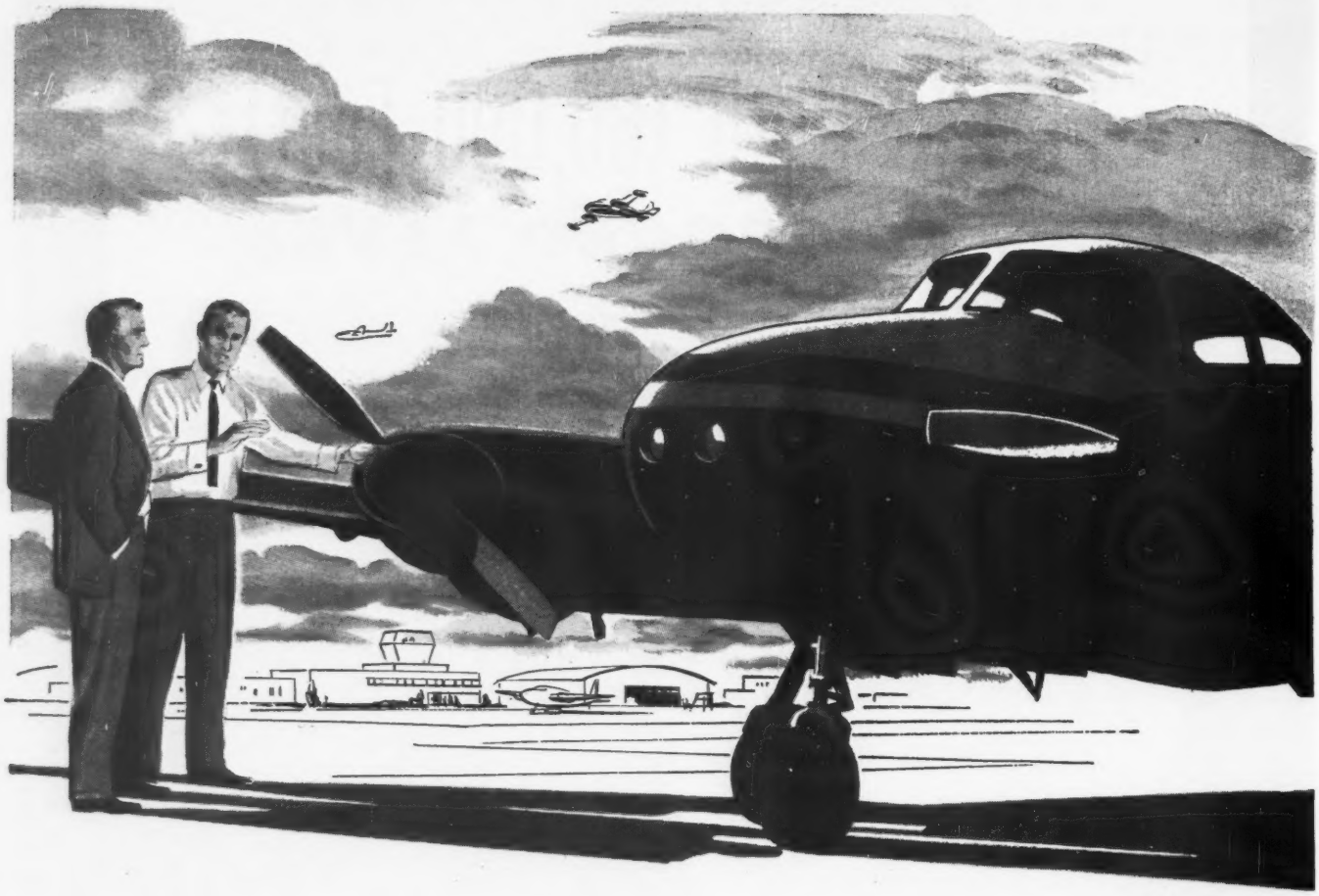

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technical detachment, who could find the time to fly twenty jet fighter hours a month. And more flying time means more money from Congress.

What is the role and the mission of the Air Guard in the thermonuclear age? The Air Force Association's Air Guard Council did not attempt to find the answer in a single session. Instead study groups were appointed to look into these modern weapons systems.

Bernard M. Davey of Atlanta, Ga., who commands the 116th ANG Wing; Milton O. Barth of New Orleans, and George D. McMorries of Dallas, will explore the impact of the F-86D on the Guard. Dale Hendry, a warrant officer in the Idaho squadron, will study the Falcon-firing F-89H.

The Century Series, including the F-100, F-102, and F-104, will be looked into jointly by Robert Campbell of Los Angeles, lieutenant colonel in California's 146th Wing, and Ed Mack Miller, captain in Colorado's 140th Wing.

The F-94C survey will be made by Philip E. Tukey, Jr., of Bangor, commander of Maine's 101st Wing, and William W. Spruance of Wilmington, will search out the missiles field.

The final study, which will involve Air Force plans and requirements, will be made by Donald J. Strait, commander of New Jersey's 108th Wing, who, in civil life, is Deputy Assistant Secretary of the Air Force for Reserve Affairs.

The studies should be of more than passing interest to the military planners for they will have at hand an evaluation of the Air Guard's ability to handle complex equipment made by a representative group of Air Guardsmen themselves. This has not been the case heretofore. The mission has been defined and the Air Guard has been given equipment the Regular establishment no longer requires in its active force inventory to cope with that mission. Some have felt that this puts the cart before the horse.

In any event, the war planners will have an opportunity to become acquainted with the studies. When completed, they will be consolidated by Chairman Schwab and Robert P. Knight of St. Paul, secretary of the Council, and sent to the National Guard Bureau.

The Council's studies should provide at least partial answers to the questions posed by its chairman. And, on the assumption that the Guard can find a way to operate the Century Series effectively, the Council has made two concrete proposals that would materially help Air Guard pilots ease the transition to electronically-controlled, rocket-firing aircraft.

It proposes that some means be found to establish an Air Guard weapons employment center, similar to those of the Air Force at Luke Air Force Base in Arizona and Moody Air Force Base in Georgia. And it proposes that the Air Guard begin to send their pilots on temporary duty to Air Defense Command units for training in the F-86D.

The Council's thoughts on the project it has proposed for itself were helped considerably by a briefing at ADC headquarters before the business meeting began. After Maj. Gen. George F. Smith, chief of staff for Continental Air Defense Command, had set the stage, four subjects which bear on the Guard's future were covered in concise fashion and understandable language.

Lt. Col. W. A. Tapscott discussed the radar improvement program; Lt. Col. D. H. Higgins, Jr., briefed the group on SAGE (Semi-Automatic Ground Environment); Lt. Col. C. J. Butcher talked about weapons; and Col. Ben I. Mayo, Jr., discussed the relationship between the Air Guard and Air Defense Command.

The Council studies, in themselves, may not determine the future look of the Air Guard. But they could serve the very useful purpose of making more people give more thought to the subject. There is always a possibility that the Air Guard, which represents a formidable defense force within itself, could be counted out of the future because of inertia or lack of vision.

Last month's Colorado Springs meeting of AFA's Air Guard Council set the stage for considerable thinking about the Guard's future. The problems are as complex as modern fighter aircraft but the Council's interest may serve as a springboard to their solution.—END

Col. Philip E. Tukey, Jr., Bangor, Me., arrives via F-94.

Lt. Col. I. G. Brown, ADC project officer for the Council briefing, talks things over with chairman Alfred Schwab.

AFA Guard Council members around the table, ready to begin discussions during meeting in the Broadmoor Hotel.

Left to right: Dr. Howard Baller (radar systems and counter-measures, computers); Dr. Cledo Brunetti, Director of Engineering and R & D (electronic design, automation); Donald F. Melton (nuclear handling, automation equipment); Dr. John E. Barkley, Associate Director for R & D (solid state, infrared)

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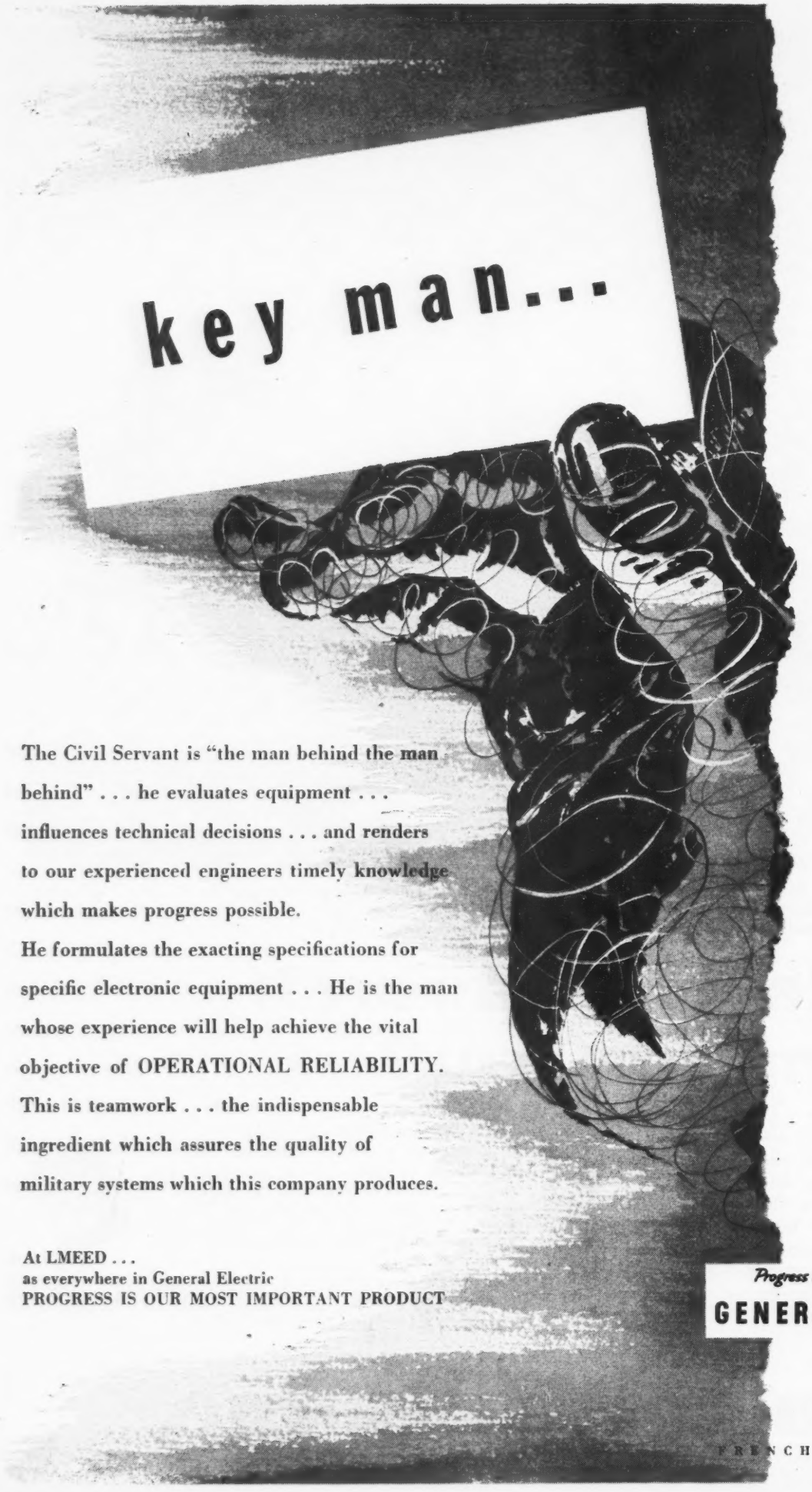

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Five Roads That Lead to a More Effective Air Force

From left: Secretary of Defense Charles E. Wilson, Roger M. Kyes, AF Secretary Donald A. Quarles, and AF Vice Chief of Staff, Gen. Thomas D. White, at dinner honoring Kyes.

Roger M. Kyes, former Deputy Secretary of Defense, received the AF's Exceptional Service Award on April 23 at a dinner sponsored by the Aero Club of Michigan at Detroit's Hotel Statler. The citation said that as Deputy Secretary of Defense from 2 February 1953 to 2 May 1954 Mr. Kyes "forcefully and effectively supported the importance of airpower as an instrument of national policy." We feel his acceptance speech, below, merits publication. —The Editors.

LESS than a decade has passed since the birth of the Air Force as a separate entity. In this short span of years you have built a great military service. I know that you have faced many difficulties along the way. That these have been surmounted with foresight and courage is to your everlasting credit.

Under the leadership of General Twining, Chief of Staff, and General White, Vice Chief of Staff, you have developed a splendid Air Force that is equaled by none throughout the world. Today you not only have the confidence of all the people, but every segment of our government.

Your achievement brings with it new responsibility. From this day forward it is essential to your service and to the nation that your policies be determined and implemented in a manner which reflects the stature of true leadership. It should be by your example that new high standards be attained in military affairs.

Your organization must continue to be alert and highly efficient so that the inner strength of the Air Force shall be sufficient to meet every challenge in war and in peace. . . .

Every friend of the Air Force, out of respect for the achievement of these men, should embrace a new obligation—that of conducting every effort to support airpower with the same high standard exemplified by the Air Force.

A number of people have asked me what I deem to be most important to the immediate future of the Air Force.

I believe there are five areas of major importance.

To those of you who support airpower there are three objectives you should support wholeheartedly.

The first is the 137-wing Air Force. It was the desire of its architects to create an Air Force with greater range and combat strength than any other country would achieve in the same length of time.

This plan encompasses a complete program for sustained research and development, advanced aircraft, highly skilled, technically trained manpower, a highly flexible complex of bases, and the elimination of cycles of strength and vulnerability imposed upon the Air Force by the changing temper of the times.

This program also envisions an adequate complement of pilotless aircraft, commonly termed guided missiles, as they become available in quantity.

The effective achievement of every element of the 137-wing program is vital to national security.

The second area of importance is essential to the permanent stature of the Air Force.

This country has been blessed with fine and capable officers as Chairmen of the Joint Chiefs of Staff. Presently, we are particularly fortunate to have Admiral Radford carrying this responsibility. However, the sands of time have a way of running out so there will be a day when he will furl his flag. When that day comes, the next Chairman of the Joint Chiefs, under the rotation system, should be an Air Force officer. I personally can testify from my own knowledge and experience that there are several men in the Air Force who are capable of discharging this responsibility with distinction.

Supporters of airpower should make known to everyone the outstanding capabilities of Air Force officers.

The third vital subject is, in my opinion, paramount in its importance to national security. One of the tragedies of our time has been our neglect of the personal problems of Regulars in the Air Force, both officers and men. I do not subscribe to the popular view that because officers and men are dedicated to military careers their services should be remunerated at a discount in comparison to like contributions in other phases of American activity. Some improvement has been accomplished toward better remuneration and pensions, but in my opinion the present status of these men and their families is still unsatisfactory.

I for one cannot rest in good conscience until this problem has been solved. I hope, too, that friends of airpower will direct their efforts toward a better situation for these men and their families.

The last two areas are directed to you men who are responsible for the administration of the Air Force. They have to do with personnel. I believe there are two major areas of weakness, the correction of which will contribute immeasurably to higher morale among your officers.

The first problem has been an outgrowth of the separation of the Air Force from the Army. The transfer of records and the reorganization of the service caused a number of young officers to lose their apparently rightful positions on the promotion eligibility list. I know of cases where men have been thrown back several years because this condition has not been corrected. I realize that in order to make the correction it may entail an Act of Congress. Nevertheless, no matter what action may be necessary, your efforts toward a just solution will more than repay you as a military service.

The second matter of importance is the fact that in certain important segments of the Air Force there are no general officers. It would appear to me that at least the officer in charge of these respective divisions should carry the rank of general so that junior officers will have new confidence in their mission and their opportunity for the future.

Should the five important factors which I have outlined be carried to successful conclusion, I am certain untold benefits will be derived by the Air Force.

In conclusion, I again say "thank you," and to my comrades in the Air Force I say no matter where you go I shall be flying with you.

Speaking at the same dinner, Secretary of the Air Force Donald A. Quarles gave a good appraisal of the situation that faces us in the world today. His remarks, slightly abridged, appear on the following page.—The Editors.

IN THE period immediately following World War II, our possession of atomic bombs and of intercontinental bombers to deliver them gave us a considerable degree of confidence that no nation would start a war against us and face the terrible retaliation of such a force. We had what we have since come to call a solid deterrent position, that is, a position that made any aggression against us demonstrably unprofitable to the aggressor. As we all remember, during the early part of this period there was a general tendency to be complacent in the belief that the Soviets could not for many years match our air/atomic capability. As all of you also know, we have had a rude awakening. With their development of atomic and later of thermonuclear explosives, and with their recent very rapid advances in long-range, high-performance jet bombers, as well as high-performance jet fighters, we have come to the realization that our monopoly in atomic power is being seriously challenged.

To live within the operating range of high-speed and high-altitude atomic bombers in the hands of potential enemies is a new experience for this country. In spite of all that we are doing to strengthen our air defenses, we must expect that at least some enemy bombers could penetrate them just as we are confident that our own bombers can penetrate Soviet defenses.

The idealism in all of us grasps for some utopian solution to this problem which would somehow shove atomic explosives back into Pandora's box and ban systems of delivery of such fearsome weapons. And certainly we must all continue to seek ways and means for easing world tensions and bringing about international adjustments that would permit such disarmament. We must recognize, however, that the dangers in such a course are enormously greater than in the pre-atomic age. Now that such tremendous explosive power can be put up in such relatively small and easily transportable packages, we must realize that treacherous evasion of such disarmament schemes might be extremely hard to detect, and even, when detected, extremely hard to counter. Treachery can now pay an unprecedented premium to those who practice it.

This is the fundamental basis of our cautious although earnest approach to the disarmament problem, emphasizing as President Eisenhower did at Geneva last summer that ways and means of surveillance and control must precede any letting down of our guard against atomic attack. Fundamentally this guard against attack, since we cannot adequately defend directly against it, must be the ability to counterattack, and this is in fact the key to our security position. While all of our armed forces and those of our allies share responsibility for maintaining this position, it is primarily centered in our own Strategic Air Command with the atomic weapons that have been made available to it. For ten years now, this has been the right arm of our striking power and thus the guarantor of such peace from Communist aggression as the Free World has enjoyed.

Today, the requirements that such a retaliatory force must meet, if we are to retain a solid deterrent position, are changing rapidly and to our disadvantage. Dedicated as we are to a non-aggressive policy, we must create and maintain a striking force so organized and so deployed that it can withstand an initial massive aggression by a hostile air/atomic force and still be able to mount such a massive retaliation that the aggressor, regardless of the damage that he might hope to inflict on us, could still not hope to profit by this aggression. This means that air/atomic strength from here out must be measured relative to the strength of a potential air/atomic aggressor. It means that if at any time we allow our relative position to sink to a point where an enemy could hope to neutralize our striking power before we could strike back, we will be impotent and at his mercy. Worse, we invite the attack.

In cold realism, this is the situation that confronts us. We are today spending about ten cents out of each dollar of national income on military security, including military assistance to our Free World friends and allies. I, for one, see no likelihood in the near future that we can maintain a position of security with a lesser drain on our resources. As a matter of fact, we are competing with a nation of vast material and manpower resources that is currently willing, or perhaps I should say forced by its dictators, to devote some forty percent of its gross national product to its military establishment and to new capital goods to build up its military and economic potential. Moreover, technologically speaking, this is no longer a backward nation. It has today a rough numerical equality with us in scientific and engineering manpower, and is adding to its pool at a much faster rate than we are.

We certainly do not have to match the Communist bloc man for man and plane for plane. It is, however, vital to our security that we maintain a position of solid deterrent strength, and we cannot do this unless we continue to press ahead with forces of present magnitude and with very broad programs of research and development to make sure that our position will never be compromised as a result of the very rapid technological advances now being made behind the Iron Curtain.

This kind of peace by deterrence of armed might—the "balance of power" as Sir Winston Churchill called it—is not a situation that anyone would choose. It is, of course, not our ultimate goal. It is a means to an end and as far as I can see the only course of action presently open to us—except of course that we must continue an earnest effort to bring about international adjustments and thereby create conditions that may ultimately lead to the just and lasting peace that is the common aspiration of all mankind. Unfortunately, however, human beings tend to believe the things they wish. The grave danger in the present situation, as I see it, is that the talk of peace and the friendly smiles from behind the Iron Curtain may delude us into a sense of security that will result in a relaxation of our defense measures and a deterioration of our relative position to the point where terms can be forced upon us. We have it on the clear authority of the Communist dictators that the first of their terms would be the substitution of their system for ours. The penalties of such a course are obvious to this audience. The danger is that they may not always be obvious to people who long for peace. There has never been a time in all of our history when our country was as directly exposed to attack as it is now.

The people of this country have always been willing, and in fact determined, to make any necessary sacrifices when national dangers of this kind have been recognized. I believe that, given an understanding of the situation, they are just as willing and determined today. The elementary requirements are: (1) that we accept the challenge and meet it, (2) that we plan and execute our military programs as wisely, realistically, and economically as we can, but with security as the first requirement, and (3) that we pay what it costs as we go rather than charging it up to the account of the next generation by deficit financing. After all, the experience of the last few years has demonstrated clearly that we can have a prosperous and expanding economy and still meet the costs of the kind of security program we are talking about. We are buying insurance against a terrible calamity, and I submit we want to be sure that we cover our risk.—END

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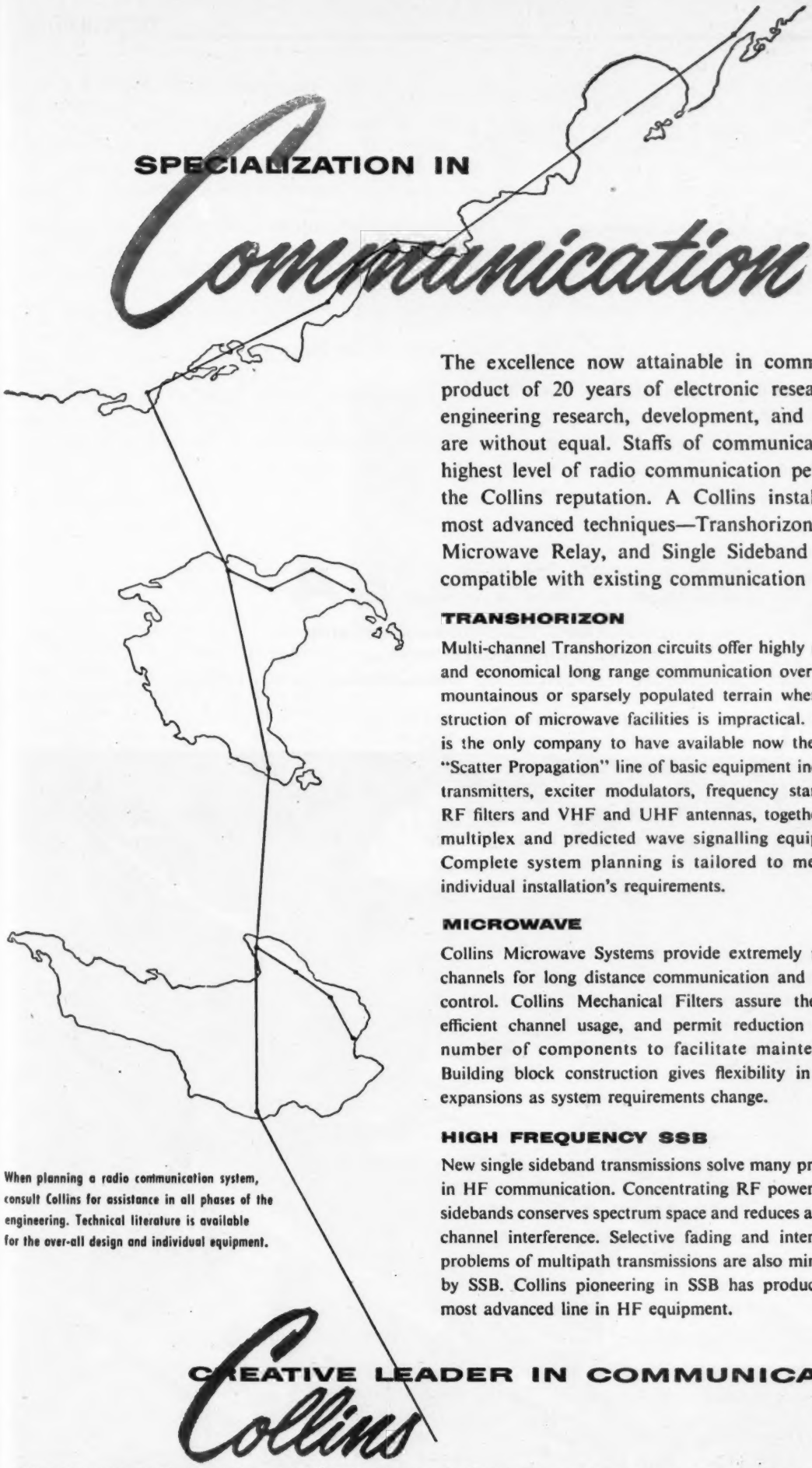

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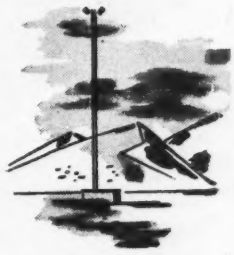

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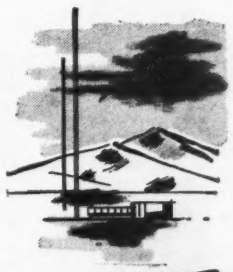

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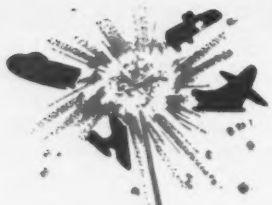

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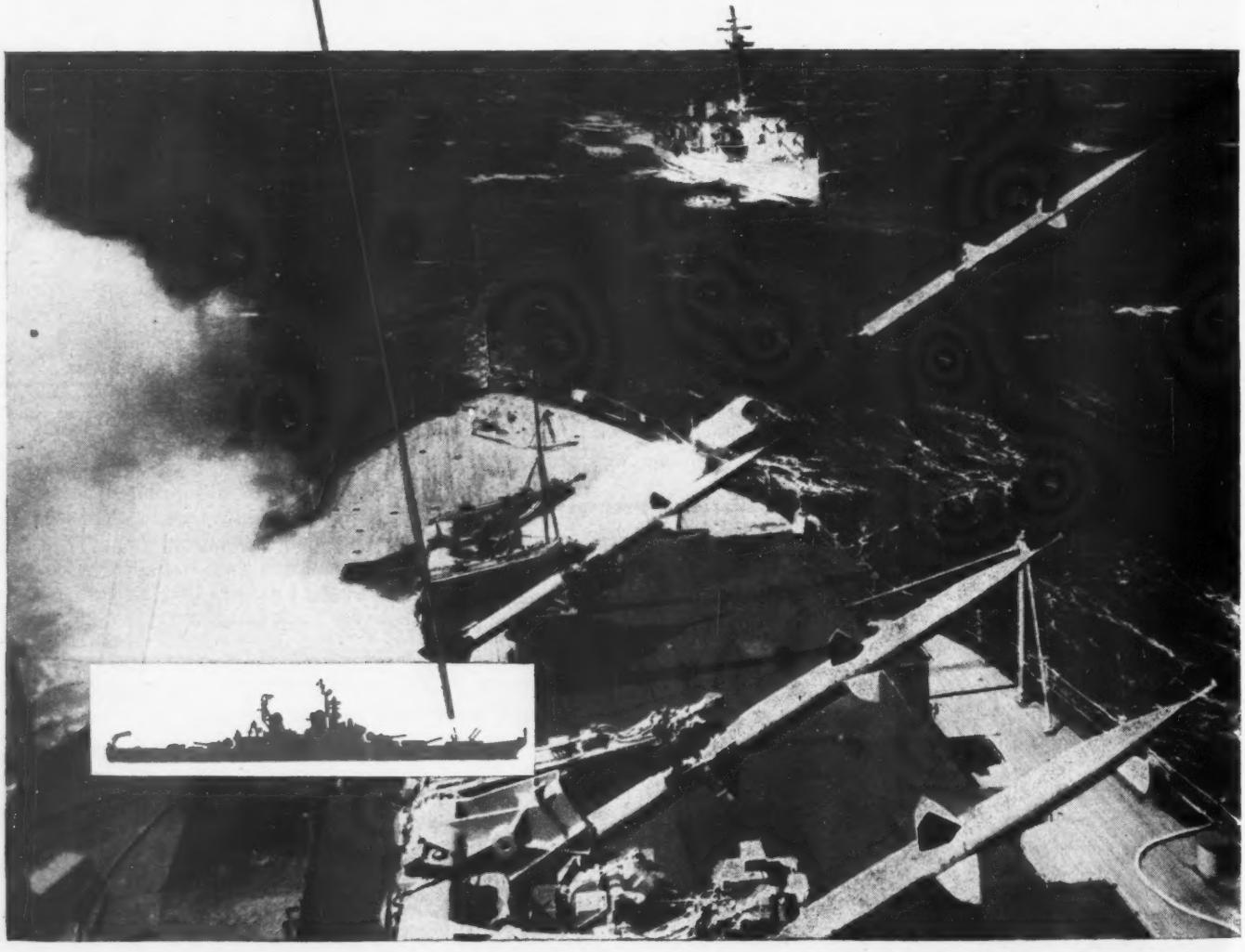


not be over-dedicated or over-specialized in the air."

The latter comment referred to a statement made by Secretary of Defense Charles E. Wilson at a press conference in which he called General LeMay a "dedicated specialist." Mr. Wilson also admitted that the Soviet Union currently was building long-range jet bombers faster than we are. This was the first public admission by the Secretary that this might be the case.

The lines were becoming clearly drawn. On one side was the school of thought which follows the old adage that "close only counts in horseshoes"—that second-best in military airpower can never be enough and that our present program is leading us in that direction.

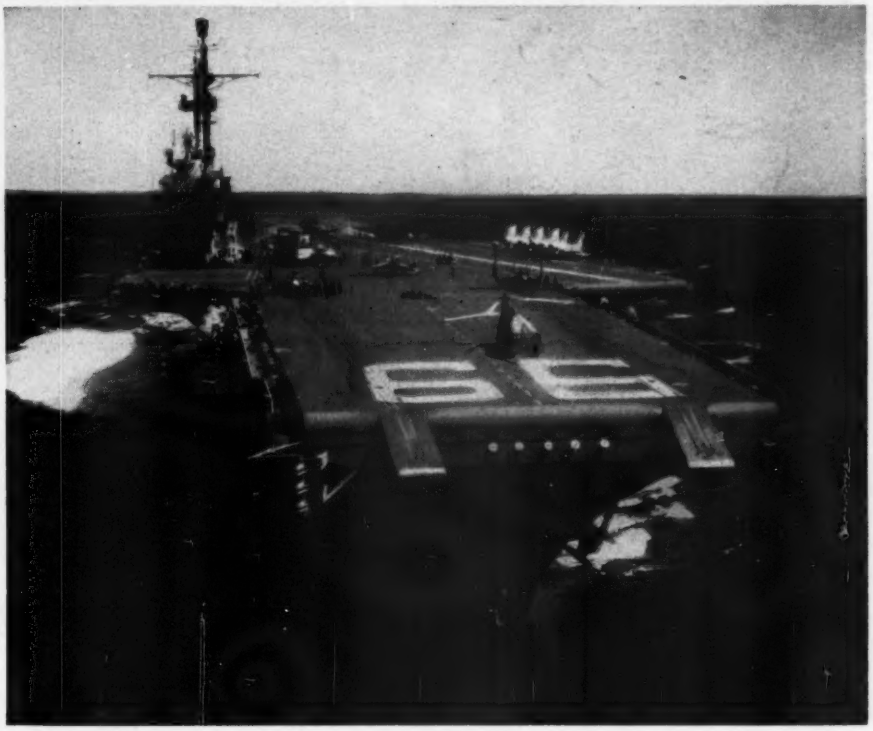
Those defending the program seemed to be making two points. The first is that we are actually stronger in the air than we appear to be, if all elements of aviation are included in the term "airpower." The second is a campaign to condition the public to the belief that we need not be strong enough to win a war with the Soviet Union and that a lesser level of strength will somehow maintain our deterrent position.

In reply to General LeMay's testimony, the Administration led with its ace—President Eisenhower. In a press conference he saw little cause for concern in the reports that Russia was forging ahead in long-range jet bombers, and left the distinct impression that carrier-based airpower is being counted on for part of the strategic bombing mission.

Mr. Eisenhower said, "I think we ought to broaden our vision a little bit more widely than looking at one particular phase or part of an organization when we begin to compare our position with those of others. . . . We have the most powerful Navy in the world. There is no Navy that even approaches it in power, and it features one thing, airpower. No one has talked about that."

The groundwork had been previously laid. Before a House Appropriations subcommittee, Adm. Arthur W. Radford, Chairman of the Joint Chiefs of Staff, had said, "I feel that the aircraft carrier today represents one of the most important parts of our over-all security program. It makes possible the location of airpower in areas into which we might not otherwise be able to put United States airpower."

In almost a paraphrase of Admiral Radford, Mr. Wilson had told a Chicago audience, "Carriers are capable of being dispersed widely through the world, and they give us the ability to project our airpower into certain areas where we might not otherwise be able to do so. . . . The aircraft carrier today represents one of the most important parts of our over-all security program . . . providing mobile bases for immediate retaliation against enemy attack."



The USS Forrestal on her shakedown cruise. Carrier aviation is currently being touted as a partial substitute for long-range strategic airpower.

And as the Symington committee hearings opened, Sen. James H. Duff, (R., Penna.) had asked that the scope of the hearings, originally directed only to explore Air Force needs, be enlarged to include naval aviation.

Later, while General LeMay was testifying, Sen. Styles Bridges (R., N. H.) said he had "great respect" for the general but urged the public to await the story of the Navy's "powerful" air arm which he said "will show the picture the other way."

Secretary Wilson threw more than the Navy into the breach of our airpower defenses. Before a Senate Appropriations subcommittee, he defined airpower as "the total strength of our Air Force, not a selected part of it, the total air strength of the Navy, the Marine Corps, the Army, the Air National Guard, and Air Reserve units of all the services, and our civil air fleet."

As naval aviation entered the strategic airpower picture, General Twining laid it on the line.

He told the Senate Appropriations committee:

"The first priority task facing the United States in any general war is winning the air battle. I know of no military leader who disagrees with the importance of this job. The part of the air battle that is vital to our survival is the destruction of the enemy's long-range air force and other intercontinental air weapons.

"Every day, in fact, every hour that the winning of this air battle is delayed would mean more nuclear bombs dropping on the United States —more lives lost, more property destroyed.

"In a war with the Soviet Union the air battle job would consist of two missions: first, defense against the Soviet air attack and, second, retaliatory attack upon the Soviet Union, especially the bases for its long-range aircraft.

"The problem of air defense will be assisted by some fighter aircraft from the Navy and Navy search aircraft are presently assigned, and will so continue, as part of the airborne early warning system that is an integral part of Air Defense Command. Aircraft carriers have an air defense capability, but it is designed for use in protecting the naval force itself, not for continental defense.

"Carrier aircraft also have an attack capability with nuclear weapons. The

(Continued on following page)

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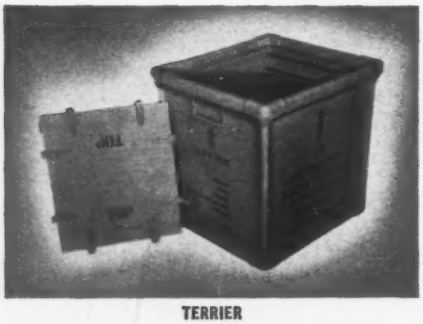

TERRIER

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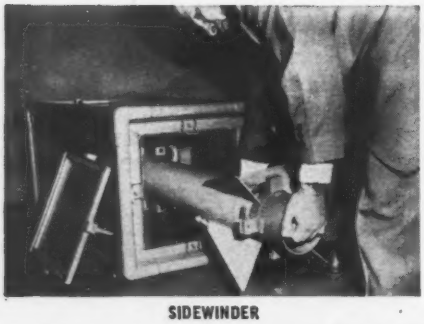

SIDEWINDER

SPARROW

SECOND-BEST——CONTINUED

size of this total capability depends on the attack aircraft complement of the carriers [which must also carry defensive fighters, search planes, and the like].

"The portion of the attack capability available to supplement the Strategic Air Command, depends upon what priority naval tasks may exist at the time. The targets that can be attacked by such carrier-based planes as are available also depend upon the location of the carriers at the time in relation to the combat radius of their attack aircraft. The range of carrier aircraft is relatively short compared with their land-based counterpart.

"But we must be realistic about such factors as the probable location of the carriers, as well as the amount of striking power they could contribute [to the strategic air offensive] which is small."

But more important than using the Navy to mask SAC deficiencies was the tacit acknowledgment of a point we made many months ago—that we are knowingly headed for a second-best Air Force and gambling that it will never have to attempt to win a war. In this connection it is well to look at the words of Rep. George H. Mahon (D., Tex.) in his summary statement preceding the report of the Air Force subcommittee of the House Appropriations committee. Wrote Representative Mahon:

"Should we attempt to stay ahead of the Soviet in the over-all size of our Air Force and in the numbers of aircraft to be produced or should we attempt to maintain what is determined to be a sufficient Air Force equipped with the best modern air-

(Continued on page 109)

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Six of these versatile McDonnell fighters, powered by the Allison J71 engine, were put through an accelerated flight and maintenance program by Naval aviators and maintenance personnel brought in from various Fleet squadrons.

The program—successfully completed more than a full week ahead of schedule—involved over 600 hours of intensive test flying under simulated combat conditions. It included catapult launchings, simulated carrier landings, night instrument flying, night intercepts, night formation flying and a full range of tactical maneuvers typical of combat fleet operation at all altitudes from sea level to very high altitudes.

By successful completion of this exhaustive test program in record time, the F3H Demon and Allison J71 clearly demonstrated the qualities of reliability and dependability required of all new equipment before entering fleet service. Already established as the fastest all-weather Navy fighter now in service, the Allison-powered Demon thus becomes a valued and respected addition to the air arm of the U.S. Fleet.

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Aeroproducts Propellers were chosen on the basis of these tests and of enthusiastic reports by pilots of MATS' 1700th Test Squadron who recently completed a successful flight evaluation program with Allison-powered aircraft.

In an eleven-month period, the 1700th accumulated 3000 hours of flight test time on two Convair YC-131C aircraft powered with YT56 engines and Aeroproducts Propellers. Within one day each of the two aircraft was flown 23 hours and 10 minutes out of the 24, and in the final four months of the program each aircraft was flown an average of eight hours per day. During this evaluation program, the propeller overhaul time was raised to 1000 hours. This program effectively demonstrated the unmatched dependability of the Allison-Aeroproducts Turbo-Prop package.

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craft to act as a deterrent to any possible aggression? As was testified by the Secretary of Defense and others, the current Air Force budget is based upon the latter determination."

Mr. Wilson put it this way: "The simple fact is that the United States is not and should not be competing in an all-out armaments race with the USSR or any other country. Our purpose, in cooperation with our friends and allies, is to maintain forces adequate to provide for the security of the Free World."

What Messrs. Mahon and Wilson both overlooked is that the question is not a matter solely of size and numbers of the US Air Force as opposed to that of Russia. It is a question of whether we or they are to have the world's *best* air force.

Two months ago we said:

"To say that we need not worry about whether we or the Soviets possess the world's Number One Air Force at any given time would represent a significant shift in national policy. For it would mean, in effect, that we are lowering our standard of what constitutes an adequate deterrent force. For deterrence through strength it would substitute deterrence through hope."

Evidently the use of the conditional "would" is no longer necessary. Such a shift in national policy has taken place and its implications are ominous. This new rationalization appears to be based on the thesis that enough is enough, that as Secretary Quarles once put it, "You can't blow a man's brains out twice." In other words, if you have the capability of inflicting a great amount of damage on the Soviet Union should she attack us, this knowledge will deter such an attack.

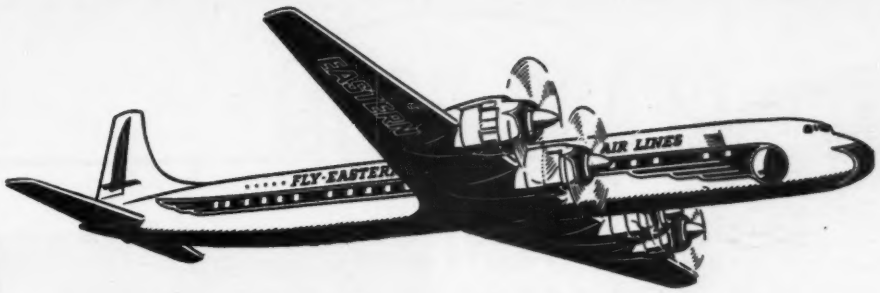
This is all very well, as far as it goes. But it is an over-simplification and thus a mite misleading. We did not do too well at the conference tables of the world when we had an atomic monopoly. We are not doing appreciably better as the Soviet Union draws abreast of us in nuclear weapons and their delivery systems. How handcuffed will we become once we have been surpassed in the air?

Even though the gloomy facts about our airpower were gradually seeping out to the public, there appeared little likelihood that anything drastic would be attempted in this election year. Although its report painted a dark picture of the relative air strengths of the US and the Soviet Union, the House Appropriations committee reported out the Administration's defense budget substantially unchanged, in fact somewhat reduced. And the House itself approved the budget by a whopping 377–0 vote, after shouting down an amendment by Rep. Daniel J. Flood (D., Penna.) calling for an additional $1 billion for B-52 procurement. There was talk that the Senate might attempt to add as much as $1.5 billion to the Air Force budget. But Sen. Allen J. Ellender (D., La.), an influential member of the closely divided Senate Appropriations committee, threw cold water on this slim hope when he said he would not back such a move because he felt that President Eisenhower "knows more about military affairs than any of his critics."

At one point in the hearings of his subcommittee, Senator Symington observed that we do not seem to be able to match the Soviets man for man, submarine for submarine, plane for plane, or scientist for scientist.

"One wonders," he mused, "what we can afford to match them at?"

Perhaps the best answer is to point out where we cannot afford *not* to match them. That is in our capability to win the air battle. Once that capability is gone—and it is going—the bullies can take over the world while the poor little rich boy wrings his hands.—END



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RESERVE AND AIR GUARD NEWS

Thirteen squadrons in the United States will be eligible to submit nominations for the third annual **Earl T. Ricks Memorial Trophy flight,** which the Air Force Association will sponsor for Air Guard jet pilots on July 28.

Of the thirteen pilots nominated, the National Guard Bureau will select eight to fly **the 1,900-mile route** between Hamilton Air Force Base in California and Moisant International Airport in New Orleans.

This year's event will be restricted to **F-86 Sabrejets,** and California, which has four of these squadrons, will submit the largest bloc of nominations. New Jersey has two nominations, and there will be one each from Maryland, Delaware, Nevada, Utah, North Carolina, Arizona, and Washington, D. C.

The thirteen squadrons represent five wings. The National Guard Bureau will select one pilot from each wing. The three additional entrants will be chosen on the basis of total flying time, total jet hours, and total time in the F-86. Each of the eight pilots selected for the event must have a minimum of 500 jet hours, a valid instrument rating, and 100 hours in the Sabrejet.

Aircraft may be flown in either the clean configuration or with tanks. If used, however, tanks must be either of the 120- or 206-gallon type. In addition, each airplane must carry 300 pounds of ballast in lieu of ammunition.

Entrants will be required to arrive at Hamilton Air Force Base two days before the event in order to attend the briefings scheduled by the Bureau on July 27. Each entrant will be authorized one support T-33 crew for the start of the event, consisting of a pilot and crew chief.

A special jet letdown procedure at New Orleans has been established by CAA but the weather minimums have been set at 2,500 feet for the ceiling and visibility of five miles. If these minimums do not exist, the event will be scheduled for July 29.

The Ricks flight is a true test of pilot proficiency. Each entrant plans his own flight and selects his refueling stops. Technicians from the pilot's unit handle his refueling at each stop. Total elapsed time will determine the winner, who will receive the Ricks Trophy on August 1 at a Reserve Forces Awards dinner in New Orleans on the opening day of AFA's tenth annual Convention and Airpower Panorama.

A perfect year of attendance at training assemblies has earned two plaques for the 9346th Air Reserve Squadron at Santa Ana, Calif. Taking part in the presentation ceremony were, left to right: Lt. Col. Claude J. Norton, commander; Mayor Countney Chandler of Santa Ana; Maj. Gen. Robert B. Landry, Fourth AF commander; and Lt. Gen. Charles B. Stone III, commander of ConAC.

The Ricks event is the only jet fighter operation of its kind in the country. It is sponsored by Air Force Association both to honor the memory of the late Maj. Gen. Earl T. Ricks, former Air Guard chief, and to point up the high level of proficiency Air Guard pilots are required to maintain.

The first event, from Los Angeles to Detroit, was won by Lt. Charles J. Young of West Orange, N. J., in three hours and twenty-seven minutes. Last year's flight, between the same points, was won by Lt. Col. James A. Poston of Columbus, Ohio, in three hours and thirty-two minutes.

* * *

The Air Force Association's third **Reserve Forces Seminar** will open AFA's tenth annual **Convention and Airpower Panorama** on August 1 in New Orleans. Four hours have been set aside for the seminar, which will be moderated by **John R. Alison,** AFA's Board Chairman and commander of the Air Force Reserve's 452d Light Bomb Wing.

Maj. Gen. William E. Hall, Assistant Chief of Staff for Reserve Forces, will open the seminar with a report on Air Force policy concerning the Air National Guard and Air Force Reserve. Presentations also are scheduled by **Lt. Gen. Charles B. Stone III,** commander of Continental Air Command; **Maj. Gen. Winston P. Wilson,** chief of the Air Force Division, National Guard Bureau; and **Brig. Gen. Robert L. Scott,** head of the Air Force's Information Services division. Arrangements also are being made for a key figure in American industry to discuss industrial relations.

Highlight of the seminar will be a **manpower panel discussion.** The panel will consist of a Reserve flying wing commander, Guard wing commander, and a Reserve center commander. Continental Air Command will select the Reserve members, and the National Guard Bureau will appoint the Guard member. This panel will discuss methods to procure technically skilled manpower needed in the Guard and Reserve programs.

A **Reserve Forces Awards dinner** is scheduled to follow the seminar. At this dinner AFA's annual awards will be made to the outstanding ANG unit and airman in the country and to the outstanding Reserve unit and airman. Guard trophy winners will be selected by the Bureau, and ConAC will choose the Reserve winners. The Ricks Trophy also will be presented.

—EDMUND F. HOGAN

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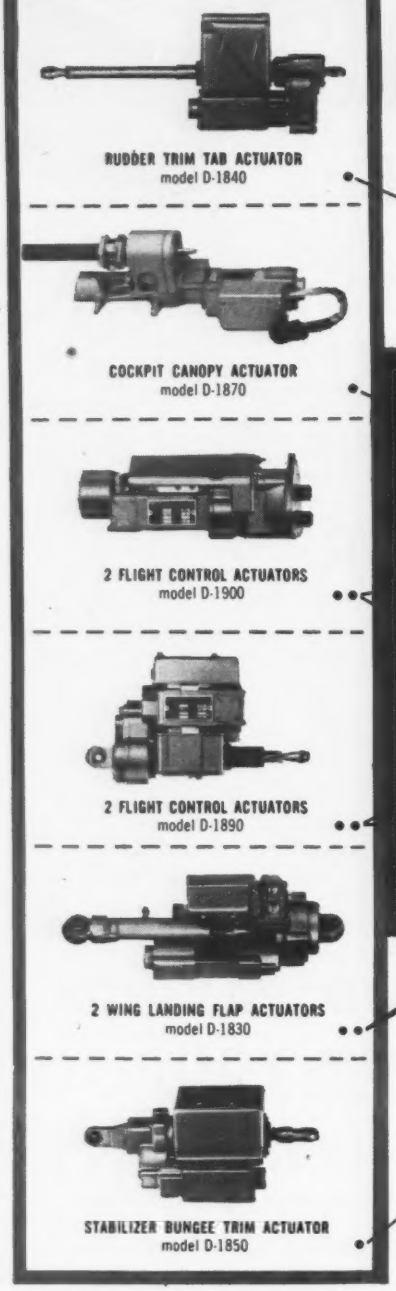

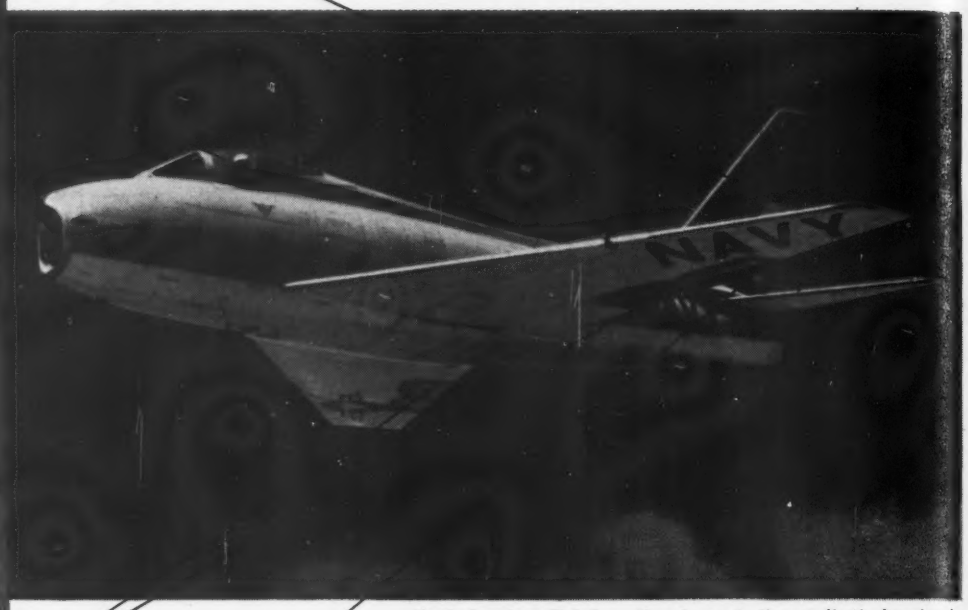

North American FJ-4 Fury. Now in production at North American's Columbus, Ohio division for the Navy, this carrier-based, swept-wing jet fighter has a high rate of climb and speed in excess of 690 mph.

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How The Six-Months 'Deal' Hurts 'Force in Being'

By Edmund F. Hogan
RESERVE AFFAIRS EDITOR

LAST month a subcommittee of the House Appropriations Committee, chaired by Rep. Overton Brooks of Louisiana, convened to hear a report on the progress of the National Reserve Act of 1955. Carter L. Burgess, the Assistant Secretary of Defense for Manpower, headed a distinguished group of witnesses.

The heart of the National Reserve Act is a plan whereby young men may elect six months of active-duty training, followed by seven and one-half years of service in the Reserve. It is designed principally for the Army and, in the beginning, neither the Navy nor the Air Force wanted any part of it. The Navy has now capitulated, leaving the Air Force as the only holdout.

The Air Force is holding out for the very good reason that it needs large numbers of highly skilled technicians to maintain an effective force in being. You simply cannot train a technician in six months. The time factor is closer to three years and so the Air Force requires four-year enlistment periods.

This is why there should be concern that so much effort is being expended toward turning out millions of weekend warriors. It also explains why the Air Force has been reluctant to avail itself of the six-month trainee. And, regardless of whether the Air Force accepts the plan or not, the fact that the other services are using it threatens to have an adverse effect on the Air Force.

When the program started last fall the Army hoped to attract some 90,000 six-month trainees by the end of this month. But the program lagged so badly that Mr. Burgess and the Army decided that a nationwide publicity campaign should call attention to the six-month deal.

Whether the six-month program is directly connected with the recent drop in Air Force enlistments cannot be proven at the moment. Air Force recruiting dipped by 3,000 in March and by more than 5,000 in April.

In terms of annual recruiting achievements, however, these figures are not as bad as they seem at first glance. The present lag is as much the result of a shortage of AF training money as for any reason. Given sufficient funds for facilities and staff, the Air Force could accept many more recruits each month than is now possible.

And the current 8,000-man lag in recruiting is hardly the true picture. For, despite the heavy opposition created by Mr. Burgess, the AF recruiting curve is up on technically skilled, prior-service men; on raw recruits with higher IQs; and even on the number of very low IQ recruits the AF is required to accept, who pass the minimum intelligence test for the services.

Over the long pull, Air Force probably can continue to meets its annual quotas. Time, of course, alone will tell. There is immediate opposition ahead, however. For Mr. Burgess told the Brooks subcommittee that the "upsurge in enlistments which occurred during March just after midterm of the school year should repeat itself, with perhaps more force, at the end of the school year in June." If he is correct, the Air Force can look ahead to a further drop in four-year enlistments.

This matter of technicians is of grave concern to the Air Force, particularly to the commander of Strategic Air Command, Gen. Curtis LeMay. At the very time the drums were being beaten across the nation to encourage six months enlistments in the Army, General LeMay was telling the Symington subcommittee that a shortage of skilled technicians is already impairing his combat capability.

To assure that no healthy, young American would overlook the advantages to him of the six-month program, the Department of Defense recently sponsored Military Reserve Week. It was launched with a Presidential proclamation. Thirty-three state governors followed suit. Radio and television gave abundantly of expensive network time. Brochures by the thousands urged young men to "End draft worries! Join the new six-month training program."

This program, our youths were assured, would permit them to plan their military service "with the least interference" to their personal lives. They were told that the six months of training would be given at the Army camp nearest their homes; that after six months "you are free to live your life"; that once back home and in an Army Reserve unit their only obligation for seven and one-half years would be a two-hour weekly training assembly and two weeks of field training each year.

This, according to one brochure, is the best insurance for America's future. Not the kind of force in being which the country needs, but a vast Reserve composed of men who have had six months of basic training. That, as our old soldiers are wont to say, isn't time enough for a man's bunk tag to stop swinging.

A keynote speaker for Military Reserve Week recalled Lord Nelson's warning that "five minutes may make the difference between victory and defeat." Today, said the speaker, this warning should be edited to read, "the first five minutes may make the difference."

This may well be true. If it is, a six-month program cannot possibly be the answer. The answer must be the force in being—the Air Defense Command fighters on five-minute runway alert—SAC atomic bombers ready to head for targets on five minutes notice.

Six-month trainees may have been useful in the days of the square infantry division, but not in an age when airpower in being is the acknowledged cornerstone of our defense structure. Any military program that will reduce its effectiveness courts disaster.

The six-month program is dear to the heart of Mr. Burgess. He is pledged to its success, and has never relaxed the pressure to swing the Air Force into line.

Mr. Burgess is clever and persistent as his barrage of six-month-trainee propaganda will testify. But we hope the AF may never have to bend the knee.—END

Civil airlines

Aerial Lifeline in Reserve

By Milton W. Arnold
VICE PRESIDENT,
AIR TRANSPORT ASSOCIATION

World War II ATC C-47 in Egypt. CRAF is based on the experiences of two wars.

COME an all-out war, the government has contracted to purchase an airlift package from the airline industry. The package is called CRAF, Civil Reserve Air Fleet.

CRAF is made up of a fleet of airliners capable of moving men, machines, and materiel to the four far corners in a civilian-operated airlift, the like of which the world has never known before. Operationally, it is a plan worked out jointly by the Department of Defense, the Department of Commerce, and the operators of our civilian air transportation system.

The plan calls for integrating commercial airliners and the "know-how" of the air transport industry into the Military Air Transport Service's aerial supply line whenever it is necessary to support an emergency action. At the same time, a war air service pattern for the remaining civil airliner fleet is being worked out, designed to insure essential priority air traffic over the 80,000 miles of domestic airline routes and the 112,000 miles of our international system.

In short, the CRAF plan calls for taking the experience, manpower, and facilities of the commercial airlines and using them to augment the military airlift capacity (MATS), which would be taxed in the early stages of another war.

In the words of Lt. Gen. Joseph Smith, the Commander of MATS, who is charged with implementing the entire CRAF program, "CRAF is a mobilization of civil airlines *capability*. It is NOT a militarization of the airlines."

The plan provides for:

- Orderly, yet rapid, transition of the civil airlines from normal schedules to contractual military support operations.
- Limited modification of selected four-engine civil aircraft so that equipment for long-range, over-ocean operation could be installed quickly.
- Assignment of actual routes and destinations to the civilian operators so that each airline can plan for the routes over which its aircraft will be flying.
- Deferment for essential airline operating personnel, as much as possible, from active military service.

Already certain phases of the CRAF program are in motion. There are still many things to be worked out, but the basic formula is off the runway and heading in the right direction. If needed, CRAF could be put into operation this minute!

Many of its planes, for example, have been tagged by N-number for the job. More than eighty percent of these planes have been modified to provide for a different kind of operation than their normal duties require. New planes have the necessary modifications built in, engineered, as a matter of fact, from their blueprint stages. The Lockheed Super G Constellations, for example, were designed with "quick conversion" interiors. In a matter of hours it could go from a sixty-five-passenger capacity to more than 100.

CRAF planes aren't mothballed. It is not a stand-by operation. These planes are busy day and night flying mail, passengers, air express, and freight. They constitute more than forty-five percent of the civilian air industry's four-engined fleet. CRAF planes every day are flying routes

(Continued on page 117)

In the early stage of another war, our military airlift capacity would be taxed to its limit. The Civil Reserve Air Fleet would then play a vital role. At right, an ATC C-97.

THIS IS

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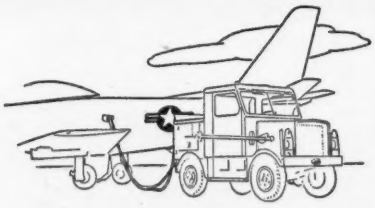
USAF MA-1

GROUND SUPPORT !



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at PATRICK AFB Missile Test Range . . .

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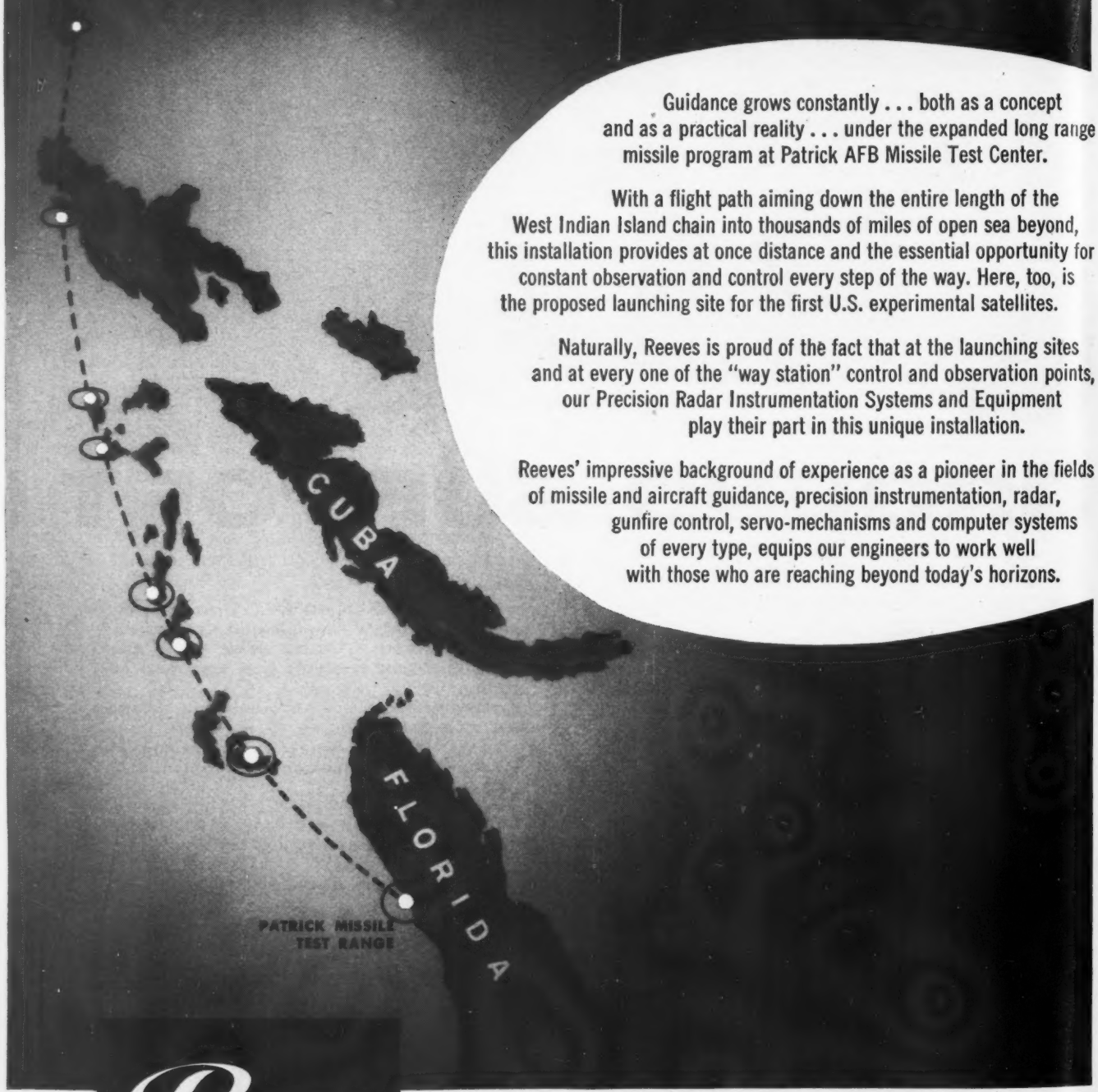

Guidance grows constantly . . . both as a concept and as a practical reality . . . under the expanded long range missile program at Patrick AFB Missile Test Center.

With a flight path aiming down the entire length of the West Indian Island chain into thousands of miles of open sea beyond, this installation provides at once distance and the essential opportunity for constant observation and control every step of the way. Here, too, is the proposed launching site for the first U.S. experimental satellites.

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which at any moment might become vital new war supply lines.

Likewise, ground personnel, flight crews, station facilities, and maintenance operations have been keyed to the CRAF plan. Rendezvous points, hopping-off points, loading points, maintenance bases, and other operational tasks have been assigned specific carriers. As rapidly as possible, needed equipment and materials for the operation of the reserve air fleet are being stockpiled. Although flight crews have not been classified by name, pilots, co-pilots, flight engineers, navigators, and all flight personel have been "alerted" and know they might be called on overnight.

The CRAF package, incidentally, has an estimated value of $400 million in aircraft equipment alone—on an initial equipment investment basis. To maintain and operate such a fleet on a "stand-by basis" would cost the government another $300 million annually. Under CRAF, the cost is much less per year.

To understand CRAF we have to go back to an Act of Congress in 1938. This law put the adolescent US air transport industry into long pants. Up to 1938 airline operations were in a state of confusion with cutthroat competition, a bad case of crash fever, and financial instability threatening our whole system of airlines. Passage of the Civil Aeronautics Act of 1938 helped a critical situation.

The Act gave purpose and mission to the airlines under a system of regulated competition and rigid safety requirements. Its ultimate aim was, and is, that the industry will become self-sufficient while serving the commerce, the postal system, and the national defense of the United States. Congress spelled out definite obligations that the air transport industry must perform as a defense partner.

Before it was three years old—still in the kindergarten of regulated competition under the Civil Aeronautics Act—air transport went to war. Six months after Pearl Harbor, more than half our commercial fleet—193 planes out of 359—was either sold outright or leased to the government. One-third of the airline personnel, top executives, pilots, radio operators, flight superintendents, meteorologists, and maintenance crews went into uniform. Their know-how formed the nucleus of the Air Transport Command (ATC) and the Naval Air Transport Service (NATS), predecessors of today's world-wide MATS operations. Airline experience pioneered new air routes across the top of the world and around its hot, equatorial middle. It developed new techniques of flying, navigation, maintenance, at home and abroad, and helped write the bible for a global network of air transport.

By war's end, on Army and Navy errands, the airlines had flown the equivalent of twenty-six thousand times around the world. They flew eight billion passenger miles and 850 million ton-miles of cargo. They moved anything and everything that would fit into a plane's fuselage. World War II was the proving ground for a whole new concept of logistics.

It proved, beyond any doubt, the value of an air transport industry in being and showed how it could be used in time of national emergency.

On the strength of this a number of government agencies and the airline industry itself began studying how to prepare the airlines for a future emergency.

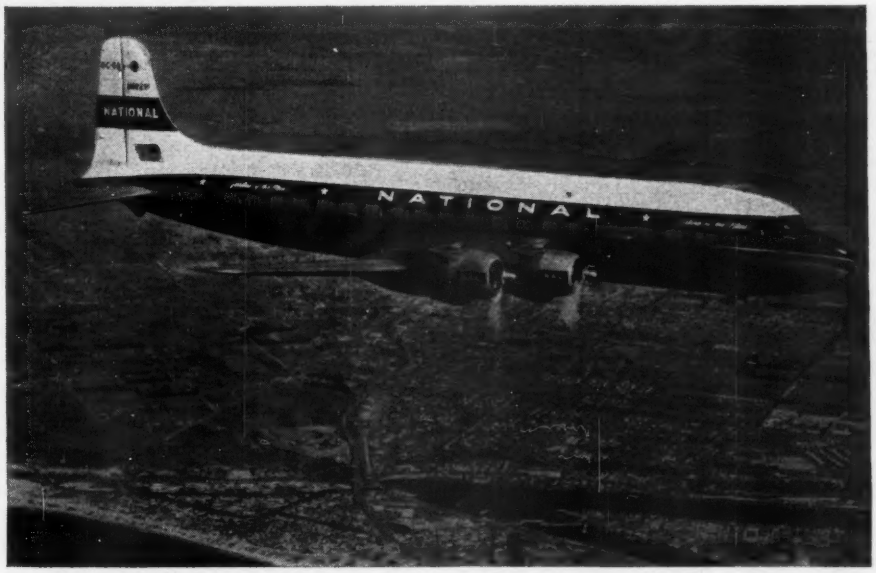
The big concern was to eliminate the obvious mistakes of World War II. As somebody put it, "Then the airlines weren't drafted—they were atomized."

Too many planes were taken away from civilian war jobs too quickly. There was no world-wide route pat-

(Continued on following page)

Forty-five percent of all civil air transport planes are assigned to the CRAF. These aircraft are not mothballed, but fly day and night.

The CRAF plan calls for integrating commercial airliners and the "know-how" of the air transport industry into the MATS aerial supply line.



As was illustrated in Korea, in any future war there will be no time to get organized. Needed air transport must be ready, on the shelf.

Planes assigned to CRAF are modified so that they can be fitted with military equipment such as navigational aids and sea-rescue gear.

tern in the beginning because there were only one or two over-ocean routes. Planes and crews got to places in a hurry, only to sit around and sweat out loading, maintenance, and uncalled-for operational delays. There was no system of air priorities worked out until months later. Airline know-how was scattered in a thousand directions before it could be collected to a single purpose.

In any future war, there would be no time to get organized. Needed air transport must be ready, on the shelf. This was proved in Korea. Using civil air transport for the Korean airlift was a sample of how ready-made and ready-for-action airlift could be used by contracting with the carriers.

This is the crux of the CRAF plan which came into being officially in 1951 after many discussions and surveys by the Department of Defense, Department of Commerce, and the civilian air transport industry. The result, CRAF, is a many-sided operation, organically. It is directed and supervised by the MATS Commander acting as an operating agency for the Department of Defense. Its operational control is under MATS. However, it is maintained and operated by the civilian air transport companies, using their personnel, planes, facilities, and experience on a contract basis. All activities are coordinated with a civilian agency, the Defense Air Transport Administration (DATA), acting for the Department of Commerce. Another agency to handle necessary air priorities is being established under jurisdiction of the CAB—to implement and run the war air service pattern.

The physical requirements of CRAF are continuously changing. Based on 1956 figures, however, the CRAF fleet will consist of more than 360 four-engined, overseas aircraft with a contingency reserve of thirty-five additional aircraft to replace losses. These include Douglas DC-4s and DC-6s, Lockheed Constellations, Boeing Stratocruisers, and the newer and larger DC-7s and Super Constellations.

Their airlift capacity has been estimated at 566,000 available ton miles per hour. But the figure is being revised upwards to around 797,000 available ton miles per hour on the basis of the proposed 1956-57 CRAF program that will include more of the bigger and faster planes.

Revised estimates indicate the numerical size of the fleet may be increased to at least 358 planes, but its airlift capacity will go up thirty-nine percent while the number of planes increases by only thirteen percent. "We are trying to keep virtually the same number of coins in our emergency fund," a DATA spokesman explained, "but we're putting in quarters instead of dimes."

Jet transports will eventually again double the capacity without substantially increasing the number. And CRAF planners are already counting on using jets in the reserve fleet.

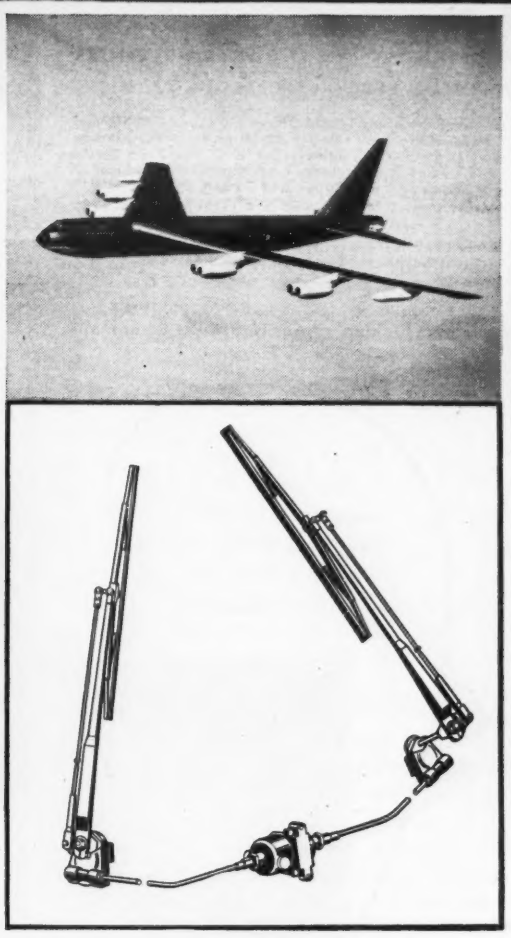
It has been estimated that the 1956-57 fleet could move an infantry division (17,500 men) across the Atlantic in about seventy-two hours. This, of course, if everything was to be thrown into the breach at one time.

The CRAF planes have also been earmarked for specific jobs. DC-4s will be used for heavy cargo shipments. The other types will be used to haul personnel, plus, of course, normal cargo hold capacity.

Modification of the planes for CRAF has been in progress for more than three years, by the airlines under government contract at airline maintenance and overhaul bases. This program involves installation of necessary wiring and brackets so that the peacetime airliners can accept military equipment. Such equipment includes new electronic systems, navigational aids, and sea-rescue gear necessary for over-ocean operations.

Initial pre-D-Day modification—brackets and wiring—adds about fifty pounds extra weight to the airliner. But the equipment itself will weigh almost half a ton. The fact that the planes are equipped to accept the

(Continued on page 121)



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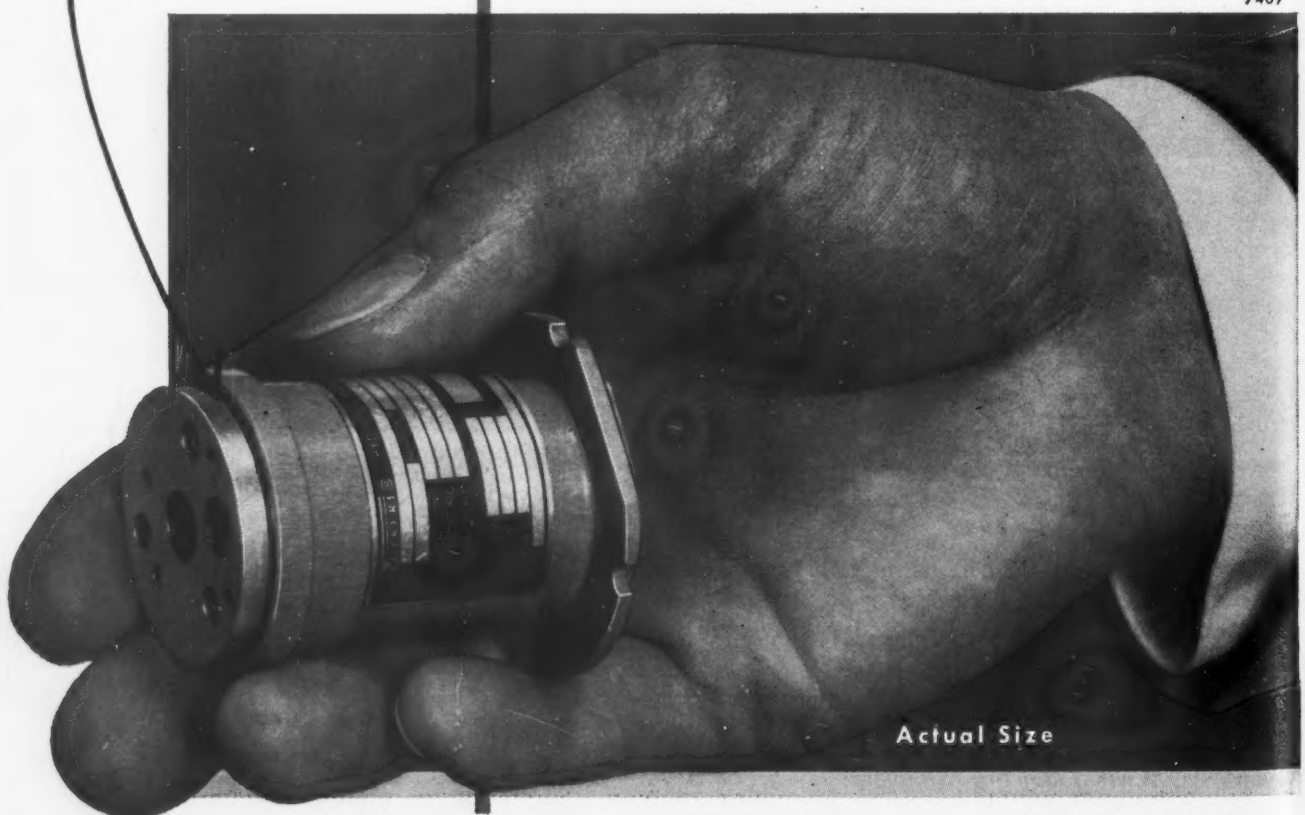


A large expansion program now in its early stages means large opportunities for additional engineers at Vickers. Write for information.

extra "black boxes," however, puts the reserve fleet that much closer to active readiness. It means planes unequipped to fly the ocean today can be fitted to fly anywhere in forty-eight hours.

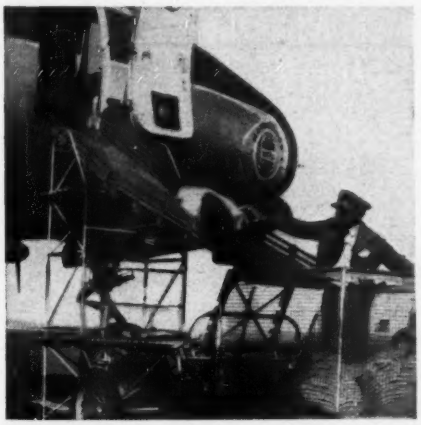
CRAF is a two-ocean operation, with an Atlantic Division and a Pacific Division. The routes for each division have already been designated. In addition to normal airline routes, several auxiliary routes have been selected exclusively for CRAF use. The airlines responsible for operating their planes over all the respective routes have their assignments. Likewise various airlines have been assigned as Senior Lodgers for each division—responsible for upkeep of CRAF bases which will become maintenance and refueling stops and necessary equipment stockpile centers for the operation.

Sixteen different airlines have been assigned to the Atlantic Division and eight other companies have been assigned to the Pacific Division. Some operators provide services for both areas. Altogether, twenty-four different airlines participate in the CRAF program. The majority are scheduled airline operators with the remainder coming from the non-scheduled and contract haulers. Each has its specific assignment.

American Airlines, Seaboard & Western Airlines, Pan American World Airways, and Trans World Airlines, for example, are the Senior Lodgers for the Atlantic Division. They will maintain and supply CRAF requirements at bases like Idlewild in New York; Santa Maria Airport in the Azores; Gander Airport, Newfoundland; Wheelus Airport in North Africa. Other carriers like United Air Lines, Northwest Airlines, and Transocean Air Lines will be Senior Lodgers for the Pacific area at places like Honolulu, Wake Island, Elmendorf AFB, Alaska, and Travis AFB, Calif.

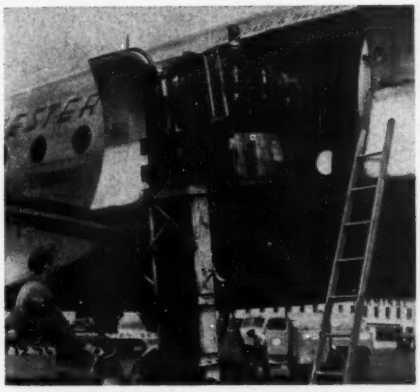
Equipment and supplies are being stockpiled at the various bases around the globe. Likewise, stockpiling of the necessary equipment for modification of the planes at the airlines' major overhaul bases has also been in effect. Under the contract arrangement the government pays for this equipment, the stockpiling, the necessary modification work. But the civilian operators provide the planes and crews and put it to use.

One of the biggest problems facing CRAF today is getting enough personnel. It is estimated that it takes about 3.5 crews per airplane to keep the fleet operating at maximum capacity. That means something like 1,400 pilots, and a like number each of co-pilots, navigators, flight engineers, alone—a total of more than 5,000 flight personnel.



Civil airlines, under contract to MATS, carry tons of service mail overseas.

Bound for assignment overseas, personnel board a MATS contract carrier.



Contract carriers also haul military cargo. Here an engine is put aboard.

The personnel problems have recently been clarified to some extent. All airline pilots, other than those serving in a supervisory capacity, are definitely earmarked for duty with the CRAF program. No longer are personnel in this category "counted twice," i.e., they may no longer fill positions as mobilization designees within the Air Force structure while being counted as a CRAF crew member. Several plans are under consideration to further resolve the draft and reserve status of airline personnel other than air crew members.

Suffice it to say, everything possible is being done to keep essential personnel of the airlines for the CRAF operation in their jobs which can give maximum efficiency to the program. The whole theory of CRAF is based on the principle of utilizing experience and know-how to the highest degree.

The man who would actually trigger CRAF is the Commander of MATS. But he will not set the program into motion without an executive order passed on to him through the Department of Defense.

A full-scale war is the real test. Here's how CRAF would work for the first forty-eight hours:

(1) All CRAF planes, wherever they might be, would return to or head toward designated modification points (the respective airline maintenance centers) where necessary equipment for overseas operation would be installed.

(2) All CRAF crews would be alerted and flown to already designated flyaway points.

(3) Senior Lodgers at the various overseas bases would be alerted and ready to receive the flow of CRAF traffic.

(4) As soon as the modification program was completed on each aircraft it would be flown to designated rendezvous points or assigned to a specific mission.

Simultaneously the war air service pattern for the remaining civilian fleet would go into effect under a priorities system.

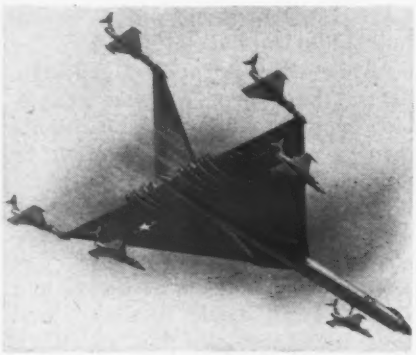
This is the plan. This is CRAF. It is being revised and revitalized every day. How well it will work can only be learned when and if—God forbid—we ever have to use it.—END

Milton W. Arnold became vice president of the Air Transport Association, Operations and Engineering, in 1946 when he retired from the AF. An active pilot since 1931, he pioneered the North Atlantic route for the Air Transport Command in World War II and later was Chief of Operations of the Second Air Division, Eighth AF. He retired as a brigadier general. General Arnold was born in Hogansville, Ga., was a 1931 graduate of the US Military Academy, and later received a degree from Cal Tech.

Tech Talk

By Bob Strobell

The Air Force has announced plans for the design and construction of a large **solar furnace** near Holloman Air Development Center, Alamogordo, N. Mex. The furnace will use a system of mirrors to concentrate the **sun's energy** on a single spot, producing temperatures as high as **7,000 degrees** Fahrenheit. It will be used by the Air Research and Development Command for **high temperature research** and testing of materials and weapon components, and for high temperature research in chemical reactions. Experiments have indicated that a properly designed, appropriately located solar furnace is the best practical means for attaining and controlling, on a laboratory basis, high level thermal radiation.



Artist's concept of atomic-powered bomber of the future, carrying its own fighters. Plan was described by Lee A. Ohlinger of Northrop Aircraft.

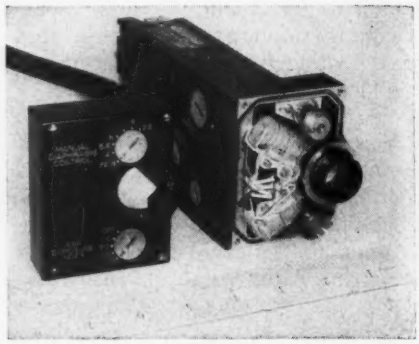
The Air Research and Development Command announced the award of a contract to **General Mills** for the design and construction of a cylindrical magnesium and aluminum, seven-foot **gondola for manned balloon flights** to high altitudes. Three ascents, **to study the problems of escape from aircraft** at very high altitudes, are scheduled for this fall or next year. Two volunteers from the AF's Aero Medical Laboratory will ascend in the pressurized gondola and one will bail out at a predetermined altitude, using the free-fall technique with only a stabilizing parachute, until his main parachute opens automatically at 15,000 feet. His companion will cut the balloon loose, releasing a stabilizing parachute on the gondola and ride it to 20,000 feet where he will bail out and also free-fall to 15,000 feet. The balloon is expected to reach heights of **63,000, 75,000, and 90,000** feet on the three flights from the Holloman Air Development Center, N. Mex.

Boeing XB-47D Stratojet modified for the Air Force as a flying test bed for the Curtiss-Wright T-49 turboprop engine. The T-49s replace the usual inboard twin-jet engines. Propellers are Curtiss Electric, fifteen feet in diameter.

Fighter pilots of World War II will remember with mixed emotions the **gun camera** and the combat films which it produced. The gun camera is still standard equipment for recording gunfire in combat, but the World War II model had its limitations. It had to be pre-set on the ground, and the pilot could not adjust the camera to compensate for changing light conditions during the mission. As a result film was over- or under-exposed as the fighter, engaged in combat, pointed the camera first at a brilliant sky and a few seconds later toward dull overcast or dark areas on the earth. To solve this problem, the **Fairchild Camera and Instrument Corp.** has developed the **KB-5 gun camera** *(see cut)* which **automatically adjusts itself to varying light conditions.** It has seven lens openings and can adjust through its six stops in less than two seconds. It should produce a much higher percentage of properly exposed combat film than the World War II type with its one lens opening.

The Air Research and Development Command is now using a "crystal ball" to photograph the development of clouds in the sky and the variations of light transmission in the atmosphere. **Radio Corporation of America's Full Sky Recording Camera** *(see cut),* uses a crystal ball above the lens to produce a 360-degree view of the sky. The camera will supply data on the development of sky coverage, turbulence, and the poor transmission of light due to salt and dust particles in the air—elements which produce **distortion in camera recordings of missile launchings and flights.** The sky camera in use at the AF Missile Test Center, Fla., takes an exposure every fifteen minutes and analysis of the film provides data which is used to obtain better film coverage of missile launchings and flights. One example is the determination of the proper filter to be used depending on the amount of salt particles in the air.

(Continued on page 125)



Miniature automatic exposure control mounted in Fairchild's new KB-5 gun camera can change aperture openings through six stops in 1.8 seconds.

Crystal ball reflects the entire sky to a camera which takes a picture of the cloud coverage every fifteen minutes at AF Missile Test Center, Fla.

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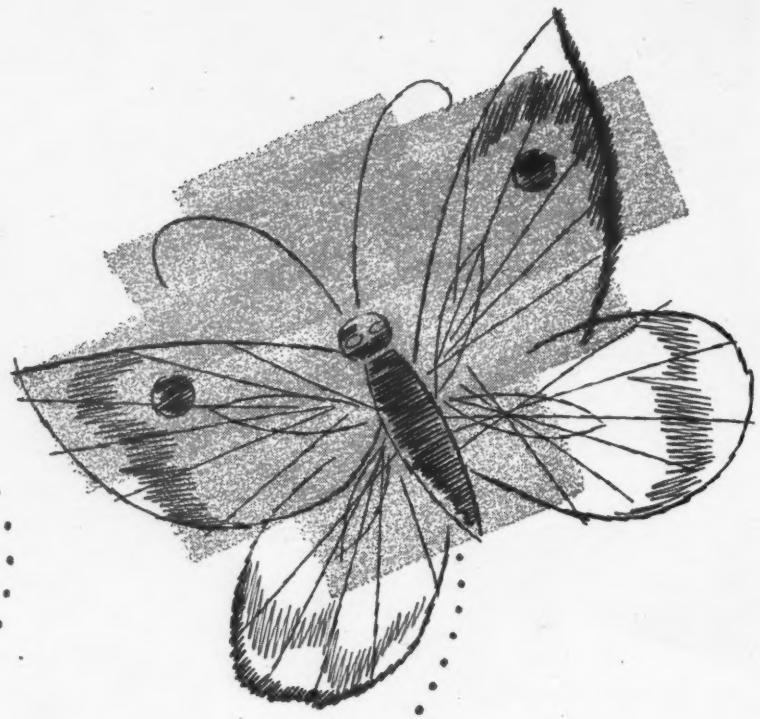
In the field of high performance aircraft, as well as guided missiles, the creative spirit is strong at Vought. Because of this spirit, America can continue to expect superior new weapons from Chance Vought—as long as the need for them exists.

SCIENTISTS AND ENGINEERS: There is a challenging place for you on Vought's creative team now. For details write: Engineering Personnel, P. O. Box 5907, Dallas, Texas.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

DESIGNER AND BUILDER OF HIGH PERFORMANCE MILITARY AIRCRAFT SINCE 1917



LIGHT
FOR
FLIGHT

ARC's new ADF weighs less than 20 lbs!

TYPE 21 ADF WEIGHS ONLY 19.7 POUNDS

Component Units Weights: Receiver, 6.8 lbs.; Loop, 4.3 lbs.; Loop Housing, 0.5 lbs.; Control Unit, 1.6 lbs.; Indicator, 1.3 lbs.; Power Unit, 5.2 lbs.
CAA Type Certificated

Fly light and navigate . . . better than ever before!

ARC's miniaturized Automatic Direction Finder is making aviation news. It offers *reliability* proved in two years of testing. The entire system weighs less than 20 pounds. Now you can have a DUAL installation where required—at a weight saving of 80 pounds or more.

The ADF still is the world's Number One navigational aid, usable on an estimated 60,000 radio stations. Now you can have ADF featuring ARC standards of performance and reliability. This system incorporates hermetic sealing of critical components such as the entire loop assembly. It also has other mechanical features designed and tested for dependability under today's higher speeds and more exacting operational and environmental conditions.

The Type 21 ADF covers all frequencies from 190 kc to 1750 kc. It requires less power—only 2.8 amps at 27.5 volts dc input. Extremely low drag of the loop is an outstanding feature. Housing extends only 2 inches from the skin of the aircraft.

Now make room for more payload and other equipment. Fly with ARC-reliability, less weight, less space, less drag. Ask your dealer for complete details.

Omni/ILS Receivers • Course Directors • UHF and VHF Receivers and Transmitters LF Receivers and Loop Direction Finders • 10-Channel Isolation Amplifiers • 8-Watt Audio Amplifiers • Interphone Amplifiers • Omnirange Signal Generators and Standard Course Checkers • 900-2100 Mc Signal Generators

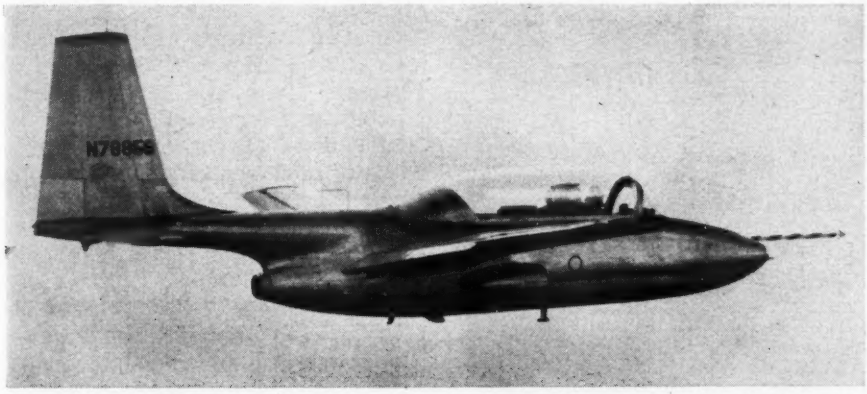
Dependable Airborne Electronic Equipment Since 1928

ARC

Aircraft Radio Corporation BOONTON, NEW JERSEY

Douglas Aircraft Co. has ordered a **DC-8 flight simulator from Link Aviation.** The first simulator to be produced for an American commercial jet airliner, it will be in operation before the first DC-8 is rolled out of the factory in the spring of 1958. Douglas will use the **simulator to train its own pilots** and to provide preflight familiarization to pilots of the ten airlines which have ordered DC-8s. The simulator will cover all phases of cockpit operation including simulation of the radar equipment which will be used by DC-8 pilots to detect weather turbulence. A cockpit motion system will be incorporated to simulate rough air and to pitch and roll in response to pilot control.

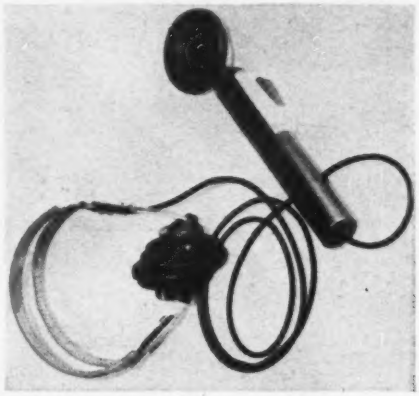
Temco's primary jet trainer, the Model 51, made its first flight in March and is now in the flight test stage. The two-place, tandem, all metal monoplane *(see cut)* is powered by a Continental YJ-69-T-9 turbojet engine which produced 920 pounds of static thrust at sea level. Maximum level flight speed is 285 knots at sea level. The trainer is **equipped with ejection seats, a liquid oxygen system,** and electrically operated trim tabs. The wide tread retractable tricycle landing gear is stressed for hard landings and is equipped with hydraulic brakes.



Temco's Model 51 primary jet trainer introduces the student to systems used in operational jet aircraft. It is equipped with ejection seats and a liquid oxygen system. The Continental YJ-60 engine can be changed in twenty minutes.

Primary flight students of World War II who suffered through the gosport tube era will be pleased to learn that the **Goldak Co.,** Glendale, Calif., has developed a **transistorized intercommunication system** *(see cut)* for instructor-student use in light aircraft where noise level is high. This self-sufficient intercom consists of a set of highly sensitive rubber-cushioned earphones connected to the instructor's microphone. The microphone is mounted on a six-inch tube containing amplifier components and a battery to provide power for 100 hours of operation.

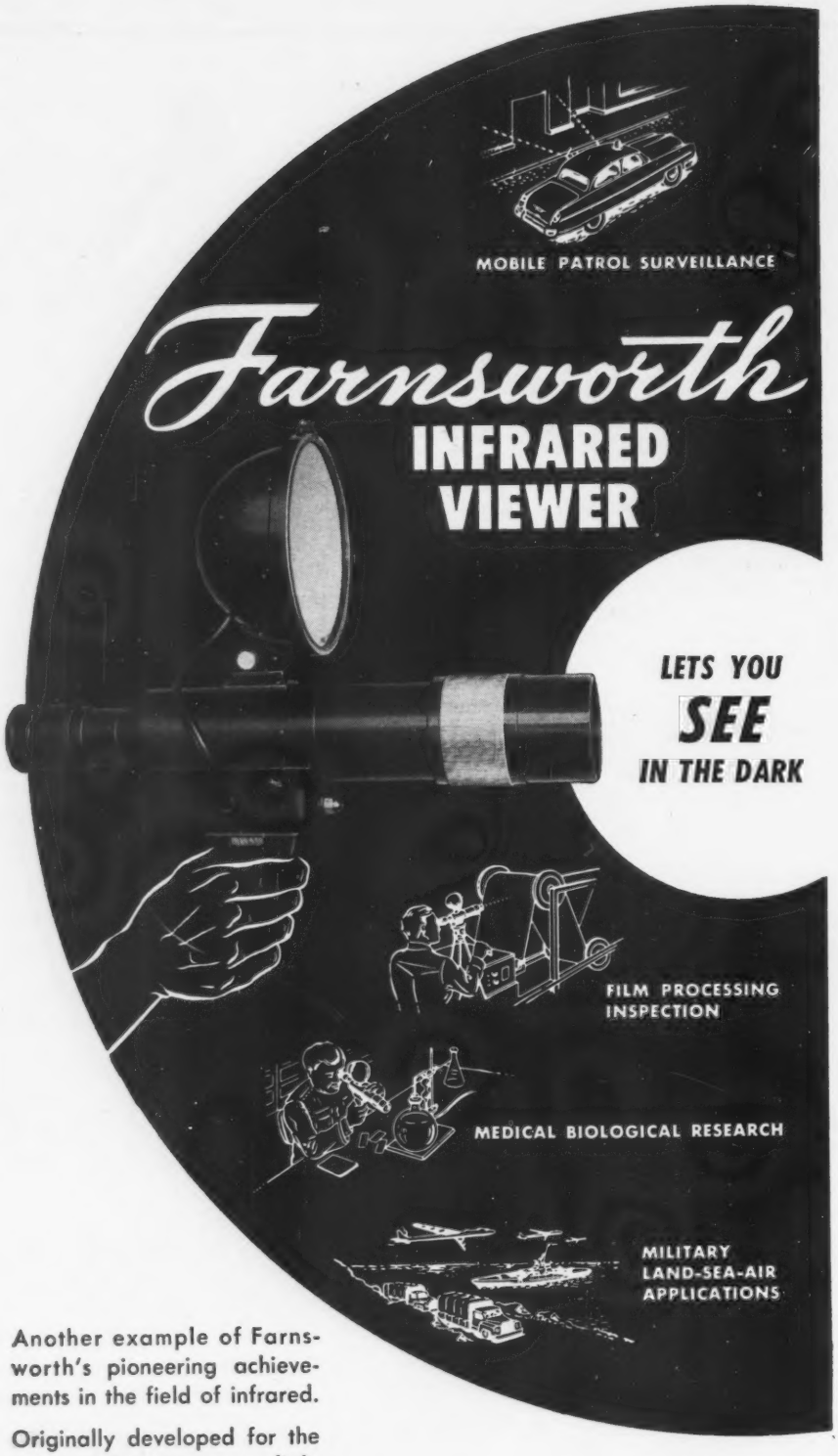
The Douglas C-133A turboprop military cargo transport made its first flight on April 23 from Long Beach, Calif., to Edwards AFB, Calif., where it will undergo flight tests. Developed for the Military Air Transport Service, the all-cargo version can haul a **50,000-pound payload 3,500 nautical miles.** The big transport has a 179-foot, 8-inch wing span, is 153 feet long, and is powered by four **Pratt & Whitney T-34 turboprop engines.** The cabin can be pressurized to 10,000 feet at an altitude of 35,000 feet. A hydraulically operated ramp built into the rear loading door can also be used as a loading platform adjustable to any truck bed height. Another door located near the front of the main cabin can be used for loading directly from truck or trailer.



Transistorized intercom, designed by Goldak Co. for instructor-student use in noisy aircraft, is completely portable.

The problem of **insuring removal** of all rivet bucking bars and small tools from aircraft at the end of the production line has long been of serious concern to the aircraft industry. The **McDonnell Aircraft Corp.** has developed a method to recover all tools. A small amount of radioactive **Cesium 147 isotope** is imbedded in the tools. Radiation from the tools can be detected with a radiation sensitive instrument, known as a **scintillation counter,** which locates the misplaced tools within the aircraft. Radiation to workers is well within the limits established by the Atomic Energy Commission.—END

The Douglas C-133A turboprop transport—developed for the Military Air Transport Service—completes its first flight between Long Beach and Edwards AFB, Calif. It can haul 25 tons 3,500 nautical miles or 50 tons for 1,000 miles.



Another example of Farnsworth's pioneering achievements in the field of infrared.

Originally developed for the military this compact, light weight Viewer is proving equally useful in industry and science, wherever there is a need to see in the dark.

For complete details on the Infrared Viewer write Dept. V-56.

Farnsworth
A DIVISION OF IT&T

FARNSWORTH ELECTRONICS CO. • FORT WAYNE, INDIANA

a division of International Telephone and Telegraph Corporation

RENDEZVOUS

Where the Gang gets together

2D AIR DIV. ASS'N. REUNION: The 2d Air Division Association is holding its ninth annual reunion in Chicago on August 17, 18 and 19. The following groups of the Division are holding their reunions at the same time:

Bombardment Groups: 44th, 93d, 389th, 392d, 445th, 446th, 448th, 453d, 458th, 466th, 467th 489th, 491st, 492d.

Fighter Groups: 4th, 56th, 355th (and Scouting Force), 361st, 479th.

For the past three years we have been trying to organize all of these groups under the 2d Air Division Association and have had success with six of them. However, there were apparently no rosters or group histories published for most of the others. We hope that this notice will bring inquiries from members of these groups who are not in touch with us. *M. T. Kelley, Sec'ty. 2d Air Div., 70 Randolph Rd., White Plains, N. Y.*

312TH BOMB GROUP REUNION: The 312th Bomb Group "Roarin' 20s" will hold their eighth annual reunion at the Hotel Detroit Leland in Detroit, Mich., on 17th, 18th and 19th of August. Those interested in attending write *Paul M. Stickel, 626 Caldwell St., Piqua, Ohio.*

SGT. HALFYARD: My brother is trying to locate a buddy of his from World War II. We do know that he is from one of the New England states, probably Connecticut or Massachusetts, but the last address we have for him is S/Sgt. John M. Halfyard, 31321290, Sqdn. B, Provost Office, 1260th AAF Base Unit, NADF ATC, APO 396, New York, N. Y. Anyone knowing his present whereabouts please write *Mrs. Doryce Jenkins, c/o Link-Belt Company-Dodge Works, P.O. 85, Dept. 529, Indianapolis 6, Ind.*

LT. EBERLE: Anyone know where Lt. J. K. Eberle, 0-814035, is now located? After his discharge he lived in Burlingame, Calif. He then married and reentered the service. His last known assignment was 463d Sqdn., 346th Bomb Group, APO 902, San Francisco, Calif., a B-29 outfit. *Bernard A. Dunne, 137 Glen Lake Ave., Pitman, N. J.*

toward Intercontinental TV

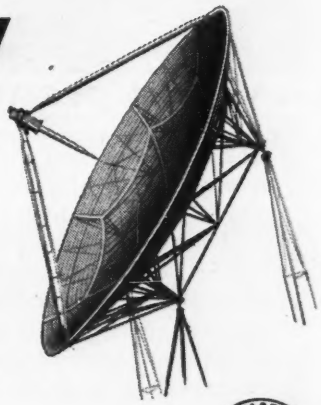
An important advance has been made in microwave radio! It's called "over-the-horizon" transmission.

Until recently, microwave was limited to line-of-sight distances, signals being beamed directly from one antenna right at another. However, engineers knew that a small part of the signal "drops off" the beam, or is "scattered" in the troposphere. A whole new concept was visualized, requiring new, specially-designed equipment.

Now, with the new technique, the signal is beamed far out over the horizon with tremendous power. Huge new "high-gain" antennas capture the "scatter," and a special IT&T electronic system keeps the signal steady for highly reliable communications.

Thus "over-the-horizon" transmission promises to span truly long distances... a big step toward the day when TV may cross the oceans. For telephone and telegraph, facsimile, and telemetering, great benefits can be made available today.

IT&T engineers were the first to introduce microwave communications, 25 years ago. And, by the development of unique equipment, they have made a major contribution toward making "over-the-horizon" microwave commercially practicable.

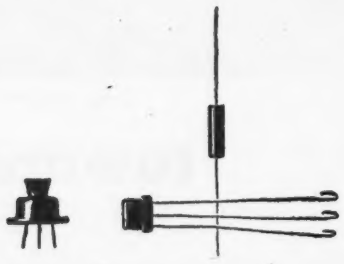


INTERNATIONAL TEL-TEL

IT&T

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, 67 Broad Street, New York 4, N. Y.

World premiere—starring Transistors



The Department of the Navy, Bureau of Ships, receives the world's first completely transistorized dial telephone switchboard . . . designed for minimum space, weight and maintenance.

In this compact switchboard cabinet (72" x 30" x 24") all line finding, circuit switching, tone signal generating, and in fact, virtually all functions of conventional dial telephone switching are performed by transistors and diodes.

Capacity of this prototype electronic switchboard is 100 lines, with fifteen connecting links. The officers and men use their telephones just as if the switching system were the conventional type. And when the ship on which this telephone system is installed docks in port, ship-to-shore trunk connections are added as easily as an extension telephone in your home.

And for those interested in production details, it's noteworthy that this compact, lightweight system is manufactured with plug-in printed circuits—providing shockproof, lifetime accuracy.

We take great pride in being a team partner with the Navy in this outstanding technological development.

STROMBERG-CARLSON COMPANY

A DIVISION OF GENERAL DYNAMICS CORPORATION

General Offices at ROCHESTER 3, N. Y.

S-C STROMBERG-CARLSON

Pennsylvania Wing's Efforts Pay Off

PROGRAMS LIKE THE NITTANY SQUADRON'S EDUCATION WORKSHOP KEEP INTEREST HIGH

Some of AFA's larger Wings have sponsored sizeable affairs that attracted as many as five hundred persons. The **California Wing,** with its well-planned and well-attended programs, is a good example. This month, however, we would like to call attention to one of AFA's smaller organizations – the **Pennsylvania Wing,** headed by **Leonard A. Work,** State College. While its events are not as ambitious as some, the Wing nevertheless maintains a consistent statewide program.

One of the best airpower programs is that of the **Nittany Squadron,** which co-sponsors an Aviation Education Workshop at Penn State in conjunction with the University, the Civil Air Patrol, and the AF-ROTC, and conducts a six-week course in air age education for elementary and high school teachers. Some of the **Pennsylvania Squadrons** pay the registration fees for teachers from their areas who attend this course.

The Wing has just begun something new in leadership training and programming. At the last Wing Executive meeting before the convention, each Squadron Commander reports on the activities of his unit. While most Wings have a similar requirement, Pennsylvania has a new twist—the reports must be substantiated with complete scrapbooks and clippings. After the final report, the Commanders grade the reports and the Wing awards the "winner" a prize of $60. Each of the other Squadrons receives a proportionately smaller amount. Philadelphia won this year.

These Wing Executive Committee meetings in Pennsylvania are almost small conventions. The **Pittsburgh Squadron** sponsored one—under the direction of **Commander Chester A. Richardson** and **Director Carl J. Long** —on April 14 at the William Penn Hotel. The meeting and banquet were attended by forty representatives of the Squadrons and the Auxiliary. After the banquet, Long moderated a Jet Age Educational program, featuring three speakers: **Clifford Ball,** Manager of Allegheny County Airport, and a founder of the Pittsburgh Squadron; **Lt. Col. G. E. Weigand,** Assistant PAS, University of Pittsburgh; and **William Butterbach,** Assistant to TWA's District Manager. The program carried out the theme of the Jet Age Conference held in February in Washington, D. C.

During his years in AFA, Work has taken dozens of thirty-five millimeter color slides of national and local AFA events, particularly those in which Pennsylvania members participated.

Following the disastrous Northern California floods this winter, **Carson Sheetz,** Commander of the **Capital City Reserve Squadron** of Sacramento, appointed a Flood Relief Committee to raise funds to help Regular or Reserve Air Force personnel whose homes had been damaged.

The drive began in February. By March 14, the nine-man Committee, headed by **Ross St. Clair,** had collected more than $2,000 in cash plus emergency supplies, clothing and food, distributed to those who needed it most. In recognition of its efforts, the Capital City Reserve Squadron is named **Squadron of the Month.**

SQUADRON OF THE MONTH

Capital City Reserve Squadron
Sacramento, Calif.

CITED FOR

its outstanding flood relief program designed to assist area citizens who suffered from the 1956 Northern California floods. This program represents a most commendable interest in community relations.

Some American cities don't want to live next door to USAF units, but the citizens of four Massachusetts towns—Concord, Lexington, Bedford, and Lincoln—believe just the opposite.

Under the leadership of AFA's **Hanscom Squadron,** made up of members from those four towns, more than three hundred persons turned out for a testimonial dinner-dance at nearby Laurence G. Hanscom AFB, to welcome the 49th Fighter-Inter-

(Continued on page 132)

Philadelphia Sqdn. Cmdr. Frank Stieber gives airpower citation to Lew Clark and John Facena of WCAU-TV.

At Hanscom's welcome to 49th F-I Sqdn., from left: Maj. H. H. Holten, Brig. Gen. John Horton, AFA's Harold Lawson, Lt. Col. Robert DaMico, and Capt. J. Robert Lilly.

Tennessee's Governor Frank G. Clement welcomes Nashville Squadron of AFA. Cmdr. James W. Rich accepts Charter as Maj. Emmett Condon (left) and Capt. Bernie Stuart look on.

SECRETARY QUARLES

Join the nation's airpower leaders

at AIR FORCE AS

1956 National Convention a

celebrating **AFA's** *tenth anniversary* NEW

Convention Program

WEDNESDAY—AUGUST 1

1:00 PM	*Reserve Forces Seminar*	*Jung*
2:00 PM	*AMC Briefing "Combat Logistics"*	*Roosevelt*
2:30 PM	*AFA Commanders Meeting*	*Roosevelt*
5:30 PM	*Reserve Forces Reception*	*Jung*
6:30 PM	*Reserve Awards Banquet*	*Jung*
8:30 PM	*AFA Directors Meeting*	*Jung*

THURSDAY—AUGUST 2

9:00 AM	*ARDC Briefing "Guided Missiles"*	*Roosevelt*
10:00 AM	*Auxiliary Board Meeting*	*Jung*
12:00 N	*USAF-Industry Luncheon*	*Roosevelt*
2:30 PM	*First AFA Business Session*	*Roosevelt*
	First Auxiliary Business Session	*Jung*
6:30 PM	*Panorama Preview-Reception*	*Mun. Audit'm*

FRIDAY—AUGUST 3

9:00 AM	*Airpower Symposium*	*Roosevelt*
10:00 AM	*Airpower Panorama*	*Mun. Audit'm*
	Ladies Walking Tour	*French Quarter*
12:30 PM	*Symposium Luncheon*	*Roosevelt*
	Ladies Fashion Luncheon	*Jung*
2:45 PM	*2d AFA Business Session*	*Roosevelt*
	2d Auxiliary Business Session	*Jung*
6:30 PM	*Mardi Gras Cocktail Party*	*Roosevelt*
9:30 PM	*Anniversary Wing Ding*	*Roosevelt*

SATURDAY—AUGUST 4

9:00 AM	*Third AFA Business Session*	*Roosevelt*
	Final Auxiliary Business Session	*Jung*
10:00 AM	*Airpower Panorama*	*Mun. Audit'm*
2:00 PM	*Final AFA Business Session*	*Roosevelt*
3:00 PM	*Ladies Tea & Charm Show*	*Patio Royal*
7:30 PM	*Airpower Awards Banquet*	*Roosevelt*

SUNDAY—AUGUST 5

9:30 AM	*Airpower Brunch*	*Roosevelt*
1:00 PM	*Airpower Panorama*	*Mun. Audit'm*

REGISTRATION FEES

REGULAR (Active—Service—Associate Members)	**$20**
LADIES (AFA Auxiliary & Lady Guests)	**$20**
NON-MEMBER (Male—not affiliated with AFA)	**$35**
INDUSTRIAL (Includes AMC and ARDC Briefings, plus USAF-Industry Luncheon)	**$35**

Note: Reserve Forces Reception & Banquet not included in registration fees—ticket $5.

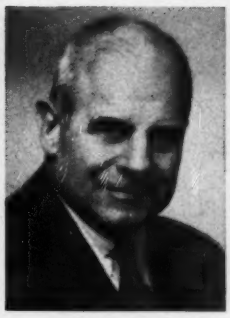
Ladies Tour and Tea $1 extra for each event.

USAF-Industry Luncheon included in INDUSTRIAL REGISTRATION *only.*

GENERAL TWINING

ARTHUR GODFREY

GENERAL LeMAY



JIMMY DOOLITTLE

GENERAL RAWLINGS

GENERAL POWER

AIR FORCE ASSOCIATION'S

Convention and Airpower Panorama

NEW ORLEANS / AUGUST 1-2-3-4-5, 1956

SORRY—

Rooms and Suites at the Roosevelt SOLD OUT!

Better hurry with your request for hotel accommodations in New Orleans. Over half of AFA's rooms are gone. The Roosevelt is sold out of both rooms and suites. The other hotels do have rooms and a few suites left.

HOTEL RESERVATIONS

The four New Orleans hotels listed below have reserved 1,500 rooms for the Air Force Association's 1956 Convention and Airpower Panorama. A special housing office has been established at the New Orleans Convention Bureau to handle hotel reservations for the Convention. All reservation requests MUST be sent to the AFA Housing Office, not to AFA in Washington or directly to the hotels. All four hotels are air conditioned. No advance deposits are required.

ROOM RATES

HOTEL	SINGLE	DOUBLE	TWIN
Roosevelt	SOLD OUT	SOLD OUT	SOLD OUT
Jung	$7-8-9	$10-11-12	$11-12-14
St. Charles	$6-7-8	$ 9-10-11	$11-13-15
Monteleone	$6-7-8	$ 9-10-11	$11-13-15

Parlor Suites

One Bedroom . . . . $25 & Up

Two Bedroom . . . . $40 & Up

FILL IN, CLIP AND MAIL TODAY!

mail to: AFA HOUSING OFFICE
New Orleans Convention Bureau
315 Camp Street
New Orleans 5, La.

Date.....

NAME .....

ADDRESS .....

CITY & STATE.....

HOTEL..... .....
First Choice Second Choice

....
Type Room Desired Rate

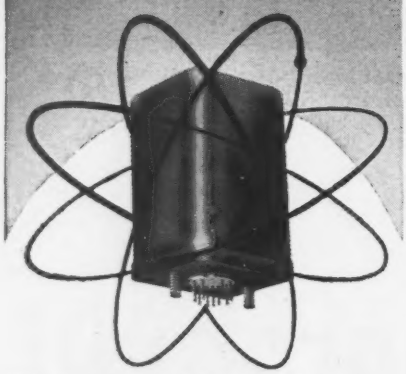
ARRIVAL DATE & HOUR.....

DEPARTURE DATE.....

OTHERS IN ROOM.....

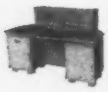
.....

Amplifiers Unlimited

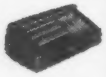


"Built-in" reliability

Whether it's a spaceship, a supersonic missile, a satellite or an electronic computer . . . DuKane's production know-how and packaging skills will produce amplifiers to your exacting specifications . . . in volume, with custom-like precision and time-table delivery at a low cost. Contact the Government Division, DuKane Corporation, St. Charles 9, Illinois.



Central Sound System



Nurses' Call

Flexifone Intercom

Sound Slidefilm Projector

Private Telephone

DuKane's commercial electronic products have established their superiority in schools, hospitals, factories and offices. Details available upon request.

DUKANE CORPORATION

ST. CHARLES 9, ILLINOIS

AFA NEWS — CONTINUED

At dedication of Hermosa, Calif. GOC post are Jack Badour, John McKellan, John Alison, Jack Baugh, and Carl Brinke. Air Harbor Sqdn., which Brinke commands, is working on GOC as a major project. Baugh is Chief Observer.

ceptor Squadron to the community.

Harold E. Lawson, Hanscom Squadron Commander, was in charge of arrangements. Principal speaker was **Brig. Gen. John C. Horton,** from ADC Headquarters in Colorado Springs. Top representatives from the state and all four towns were also present.

On Sunday, April 8, a delegation from the **Hoyt S. Vandenberg Squadron,** Detroit, flew to Washington to pay tribute to the late Chief of Staff.

Headed by **Russell Lloyd,** Squadron Commander, the group arrived on a plane from Selfridge AFB, had lunch at Bolling AFB, escorted Mrs. Vandenberg to Arlington National Cemetery, participated in a memorial service and placed a wreath on the grave, and returned to Bolling for departure to Selfridge, all in four hours.

USAF Chaplain Col. James Davidson officiated at the service and delivered the Memorial message. In addition to personal friends of General Vandenberg, representatives of the **Capital Squadron** and **D. C. Wing,** and **Walter Bonney,** AFA Director, were also present.

Washington arrangements were handled by AFA Headquarters with the assistance of **Jay Fitzgerald,** from the Heaquarters Command ISO.

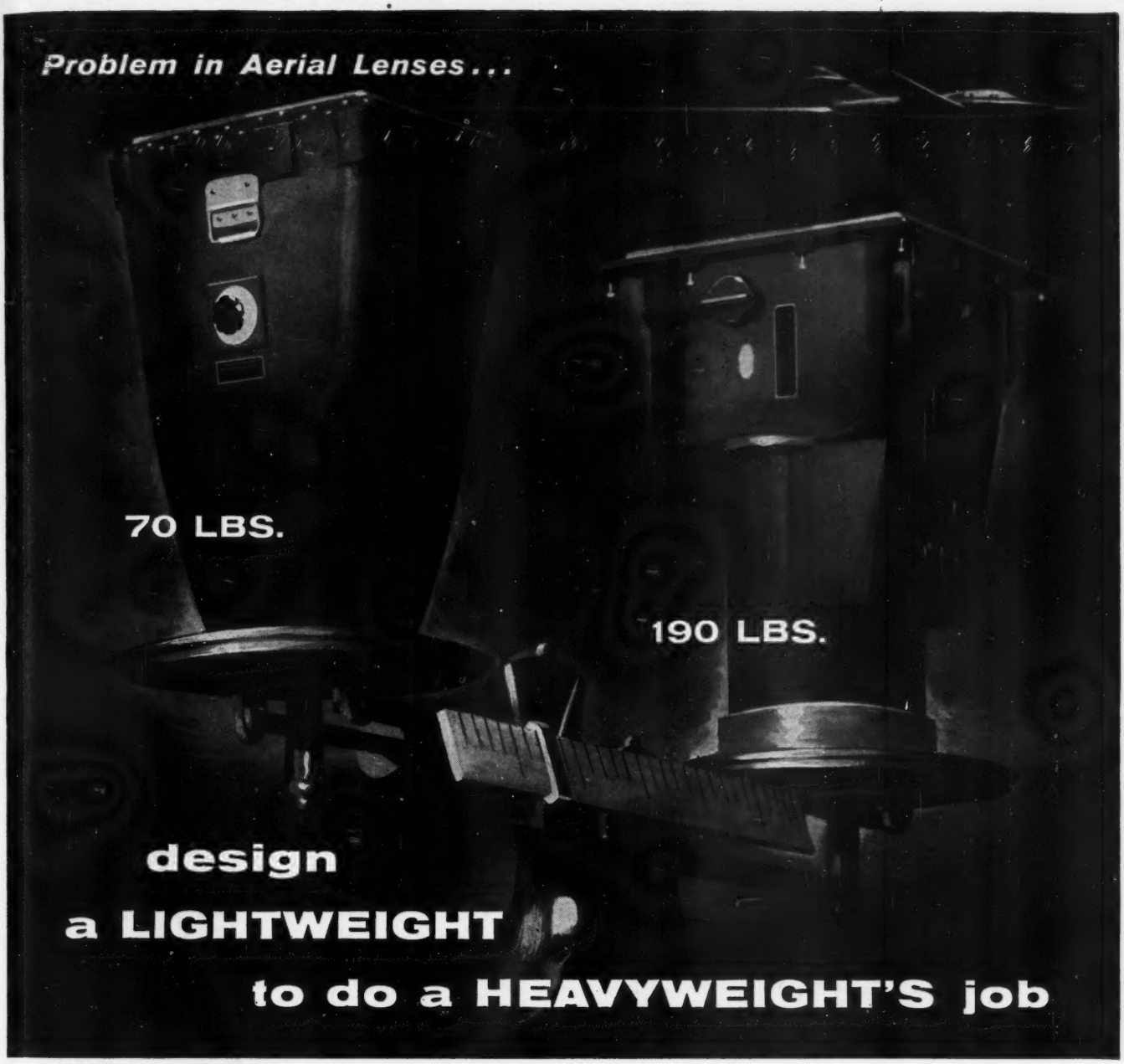
The reorganized **Broadmoor Squadron,** composed of former members of both the **Broadmoor** and **Pikes Peak Squadrons,** is now headed by **Gwynn Robinson,** Colorado Springs. The Squadron last month kicked off a new series of monthly luncheons with a program featuring **Buck Shaw,** Air Force Academy football coach, who spoke on the outlook for 1956.

With a planned airpower program in the works, Robinson has promised the members a weekly meeting with the Academy—somewhat in the nature of "Monday morning quarterback sessions"—so they can keep up with the Falcons' athletic progress.

Under the leadership of **Donald Spoerer, Illinois Wing Commander,** the **Chicago AFA Squadrons** held their "mass" installation of new Squadron officers on March 24, at O'Hare AFB.

(Continued on page 135)

Civic leaders of St. Paul and Minneapolis tour Wold-Chamberlain ADC facility as guests of the Twin-City AFA Squadron. Cmdr. Leonard Stevens is in center of the picture.



As part of its never-ending war on weight the Air Force handed Perkin-Elmer this problem: find a way to trim the fat off bulky aerial telephoto lenses — without impairing their optical performance.

Drawing on the experience of a staff that has designed and built some of the world's most complex optical and electro-mechanical equipment, P-E came up with a definitive report on lightweight lens techniques. Using these new techniques, P-E took a large lens system weighing 190 pounds, remanufactured it down to a cool 70 pounds — with no loss in optical performance!

Even more dramatic weight reductions are in the offing. P-E has recently developed a method for mass-producing aspheric lenses. This new method will make possible lens systems with greatly simplified optical elements. Here again, the answer was found by a P-E staff whose experience went far beyond mere specialization.

Other projects that testify to Perkin-Elmer's ability to take a systems problem and "see it whole":

- ROTI Mark I (Recording Optical Tracking Instrument) for tracking the flight of guided missiles.
- Airborne infrared detection systems for military use.
- The Y-4 bombing periscope for the B-47.
- Prototype optical and radar bombing and navigation system now designated MA-2 for use on the B-52.
- Most of the large aerial photographic lenses in use today by the Air Force.
- Reactor periscopes for the Nautilus and Seawolf submarines.

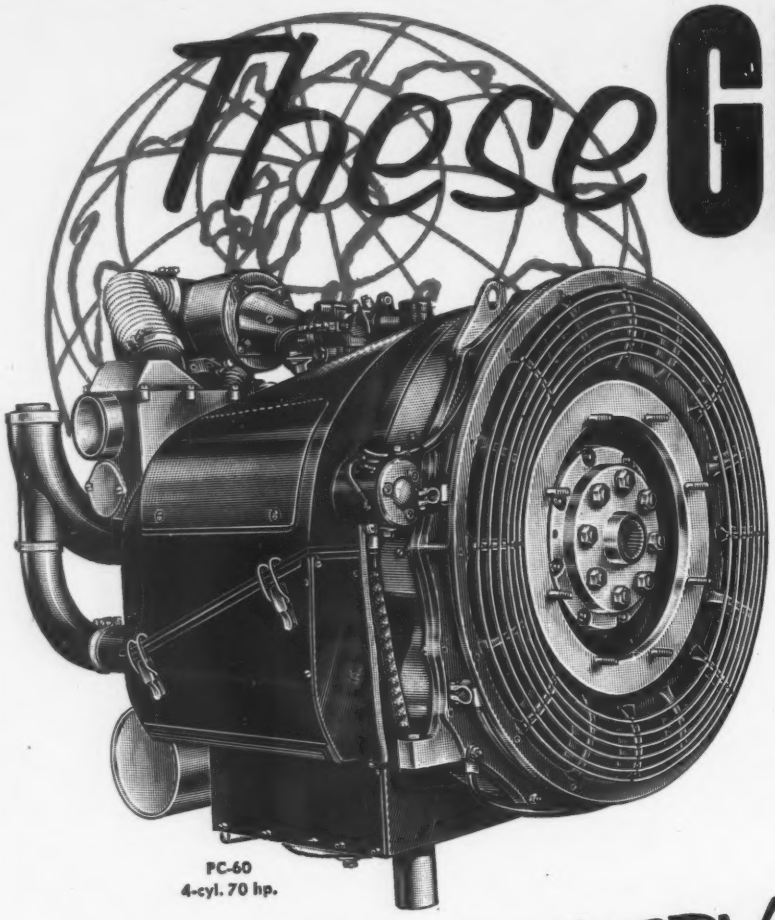
In planning your next project, invite Perkin-Elmer to sit in. Our staff and unique facilities can bring your project to fulfillment sooner than you may now realize.

Perkin-Elmer
CORPORATION
NORWALK, CONNECTICUT

OPTICS • MECHANICS • ELECTRONICS

In planning your career also — consider Perkin-Elmer. We have openings for physicists, electronic engineers and many others. We can offer top opportunities for advancement in a rapidly growing organization, located where comfortable suburban living is a reality.

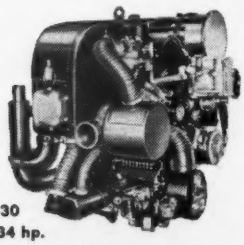
These GLOBAL PACKAGE POWER PLANTS



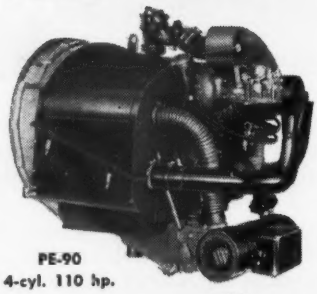
PC-60
4-cyl. 70 hp.

are at YOUR SERVICE

THESE ROUND OUT THE PACKETTE LINE



PC-30
2-cyl. 34 hp.



PE-90
4-cyl. 110 hp.

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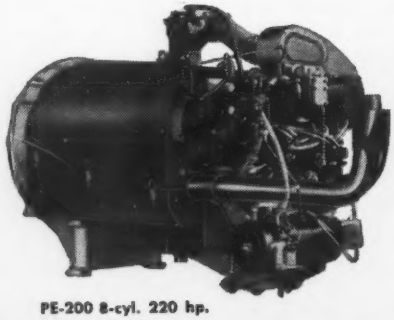
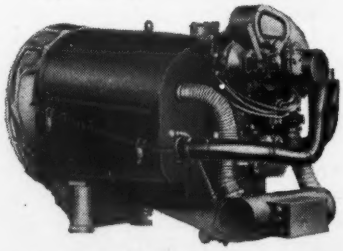


PE-200 8-cyl. 220 hp.



PE-150 6-cyl. 175 hp.

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This is the second year for this program. More than 175 persons showed up to see the new leaders of all seven Squadrons and one Flight take office.

LeRoy Kwiatt, Vice Commander of the Wing, was toastmaster for the dinner-dance program.

AFA's new **Nashville Squadron** got off to a good start on March 21, when it was officially welcomed to the community by **Gov. Frank G. Clement.**

James W. Rich, Squadron Commander, received the Charter from Governor Clement in a ceremony held during a statewide observance of "Strategic Air Command Day." Among the guests were **Maj. Gen. Winston P. Wilson,** Chief of Air Force Division, National Guard Bureau, and **Tennessee Adjutant General Joe Henry.**

Frank T. McCoy, Jr., AFA's Regional V-P there and largely responsible for the birth of this new unit, was elected to the Squadron Council. Other officers are: **Edward Burton,** Vice Commander; **Herbert Kneeland,** Secretary; **Clifford Love, Jr.,** Treasurer; and McCoy, **Leo Bolster, Willard Hawkins** and **Green Benton, Jr.,** on the Council.

The new unit is another indication of success in the efforts of **T. Harri Baker, Jr.,** Memphis, appointed Tennessee Wing Commander last winter.

CROSS COUNTRY . . . **The Vandenberg Squadron,** Detroit, is planning two big affairs—the second annual Senior's Day at Selfridge AFB, and an AF-ROTC Awards Dinner. . . . The **Lansing, Mich., Auxiliary and Squadron** donated $115 for a CAP flight scholarship. The Squadron holds its third annual AF-ROTC Banquet at Michigan State College on June 5, with **Gill Robb Wilson** speaking. . . . **The Nittany Squadron** is working on plans for its co-sponsorship of the **Penn State Aviation Education Workshop,** under the leadership of Wing Commander **Len Work.**—END.

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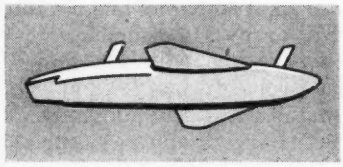
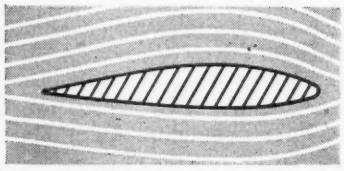


Pantobase—When designed into an aircraft the Pantobase system enables the plane to land and take-off from many types of surface without changes or additional landing equipment.



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WEST TRENTON, NEW JERSEY

Today's navigators travel a lot lighter than their WW II counterparts.

The Navigator Gets Rid of His Excess Baggage

By Louis Alexander

IF I HAD been a truck driver, the Air Force might have put me to a paper-shuffling job or some light housekeeping job, like mess officer.

But I was a skinny guy. I got into combat navigator training in 1943 by eating a bag of bananas just before the weighing-in and losing an inch of height by a little judicious stooping under the measuring rod.

The big fellows all gravitated to pilot training. I used to envy each one as I watched him walk out to his airplane empty-handed, very little in his pockets except maybe a computer and clearance form and, for all I could tell, nothing heavy on his mind either.

I would sigh, pick up my briefcase with its books and forms, yank my heavy octant case off the ground, stuff my oxygen mask under one arm and manuever my lunch box into a mashed position under the other.

I wasn't built for that kind of load-carrying, but when I got to combat I found it had been good training. On combat missions I carried the whole load into the plane with me except the books and octant. But I added, in my barracks bag, a set of long johns and an outfit of electrically heated coveralls into which I climbed while the plane was plodding up to sub-zero altitude. In all, it added up to a weight about equal to my 110 pounds.

Then I'd wrestle with log forms, maps that wouldn't match, and the long slow pull across the hundreds of miles. Every thirty minutes a position; every hour a wind and an ETA, and a mental checkup on the dwindling gas supply. Gasoline was a factor but not THE factor.

Navigation has come a long way since then. I found that out recently when I visited Ellington Air Force Base, one of the Air Force's Navigation Schools, near Houston, Tex., and swapped reminiscences ". . . flat on my back at 30,000 feet on one engine. . . ." There have been significant changes even in the last two or three years (not in the hangar flying, but in the training).

The prototype air crewman now has been converted into the new production-model, high-speed, high-altitude, long-range navigator. He works faster, he has tools that will do more. He—But let me tell you about it.

Let's take a look first at the old deal. Those World War II days were pioneering days for navigators. The aerial rating of navigator had just been invented, and graduates were trickling slowly out of the training classes at Kelly Field and Coral Gables.

Most of what an aerial observer carried was the same stuff that a cabin boy would lug aboard ship for a seagoing navigator. Obviously, the load had to be lightened when the navigator went aerial. So the Army Air Corps lightened it by eliminating the cabin boy and transferring the gear to the navigator.

Even before Korea, the B-29 was nearing the out-to-pasture stage. Training the navigators, bombardiers, and radarmen for a B-29-type Air Force was on the way out, too. Air crewmen had to learn how to meet the challenge of B-47 speeds at 40,000 feet, how to pace themselves for a B-36 workday spread over 10,000 miles. Navigator, bombardier, and radar training hitherto given to three separate crew members had to be absorbed by a single navigator-bombardier.

When the Korean war broke out there was a temporary return to narrow specialization. After the war ended the brass let out its belt a notch, sat back, and let the lessons sink in. Then the real changes in training programs began to appear on the directives.

"Give us navigators and navigator-bombardiers who can cope with jet-stream speeds in working their courses and ETAs," SAC directed.

"Give us air crews who can plan a C-124 flight across half the Pacific Ocean, using the most economical flight paths and know what's to be done on the return trip," the Military Air Transport Service insisted.

For the navigator who hasn't checked in since World War II, there's a great deal that's new; all the electronics, the taking-for-granted that the navigator will also be a good navigator-bombardier, and that the radar man will learn celestial till he knows it as well as he knows scope interpretation.

(Continued on page 139)

ABOUT THE AUTHOR

Lou Alexander's been county editor of the Houston, Tex., Chronicle *since 1947, also handles the paper's aviation news. He was a 15th AF navigator in WW II and instructed during Korea. Now a Reserve major, he's rated as a commercial pilot and teaches at a ground school at an airport near Houston. Married and the father of two daughters, Lou has been free-lancing since 1950, for aviation and trade magazines.*

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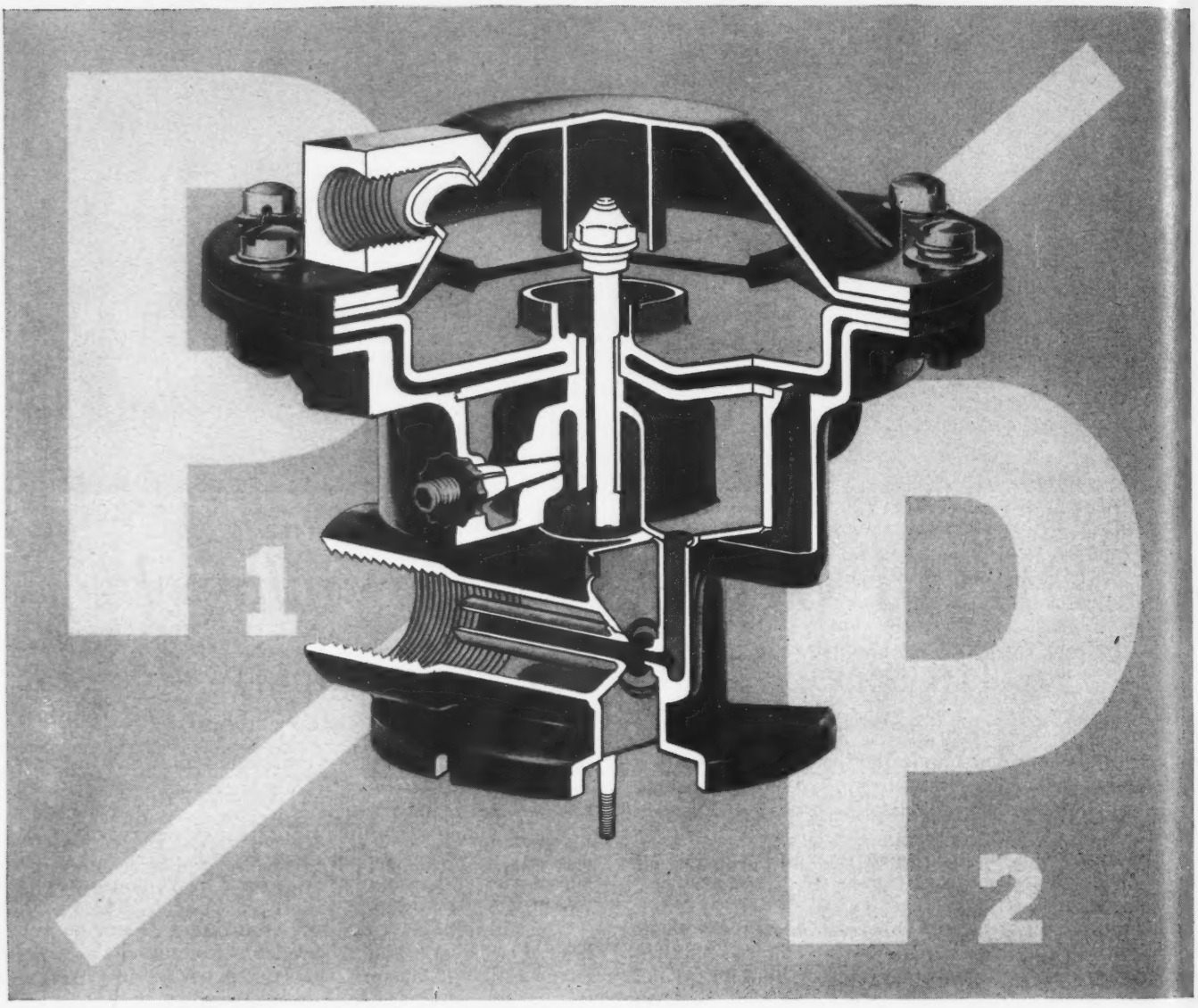

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SAN DIEGO DES MOINES

A navigator in training at Ellington AFB, Tex., takes a fix on the sun.

Periscopic octant stays in the plane but the old A-14 must be lugged about.

Q-24 radar in the T-29 does much of the computing for student navigators.

A few things are unchanged from the training of 1952 and 1953. The emphasis on mathematics, electricity and electronics continues. Dead reckoning and map reading (pilotage) are about the same, though the current computers allow for supersonic speeds and 80,000 feet instead of stopping at 400 knots and at 34,000 feet. The computor can also convert from true air speed to Mach numbers.

Retread observers before and during Korea were adding a few new arts of navigation to their repertoires. Refresher courses—which many retreads found a speeded-up school composed of mostly new material, so vague had navigation become to them—included Loran, Pressure Pattern, and a taste of polar navigation.

Now these kinds of navigation are standard. Every student observer must learn them, and prove his skill in practice missions. The Air Force thinks this kind of training is so important that before MATS or SAC gets the students AF spends—in an economy-mad age—about $600 more per student on flying time than previously.

This is the result of adding fourteen more flight missions (increasing the training schedule to thirty-eight at $9.80 per flying hour). Missions average five to six hours, and each plane averages six students aboard. The additional missions include long over-water hops, renewed at Ellington in July 1955.

Rising early for a pre-dawn briefing, a student navigator may make an over-water hop from Ellington to Miami, less than 1,000 miles. At Miami he'll be de-briefed and then may go up for a night celestial. Or he'll fan out the next morning for some Loran training.

Back at Ellington he'll sink into the sack to get refreshed for the next day's over-water flight to Puerto Rico, Bermuda or Guantanamo. For this mission he'll perspire through pressure pattern, Loran and celestial.

It may be sixteen hours from brief to de-brief, on such days.

Maybe he'll fly another mission, leaving the student barely able to whoop through a few hours liberty in distant ports before he starts the grind back to Ellington via Miami.

Radar training, too, has changed. The student navigator travels lighter now. The new Q-24 radar set, standard for training work, does most of his computing for him. The Q-24 has replaced the old Q-13 in training planes. The Q-24 is more complex, but most of the complexity is inside, in the form of computing mechanisms. The new set is easier to read, because of a greater range of intensities and better definition.

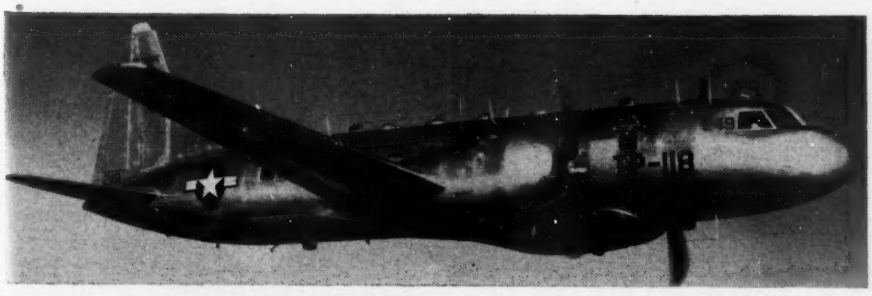
With this kind of training equipment, the step up to combat and transport equipment in advanced courses or with the operational commands is easier and quicker for the student navigator.

A few years ago I had lugged that fifteen-pound octant out to the airplane on a proficiency flight to keep my celestial navigation skill current. Now it's different; this year I watched a group of students walk out to a new T-29 "Flying Classroom," and some of them were almost empty-handed.

In the aircraft I saw the latest periscopic sextants; a model that the Air Force admits it has in quantity. This sturdy gadget juts a snorkel-size periscope into the airstream, and replaces a bulky astrodome which knocked three to five knots off the airspeed. Student navigators a few years from now may cut their eyeteeth on a photoelectric octant, now in the experimental stage, which is said to track the star once it is locked onto it by the navigator.

I used to think I was a fast man.

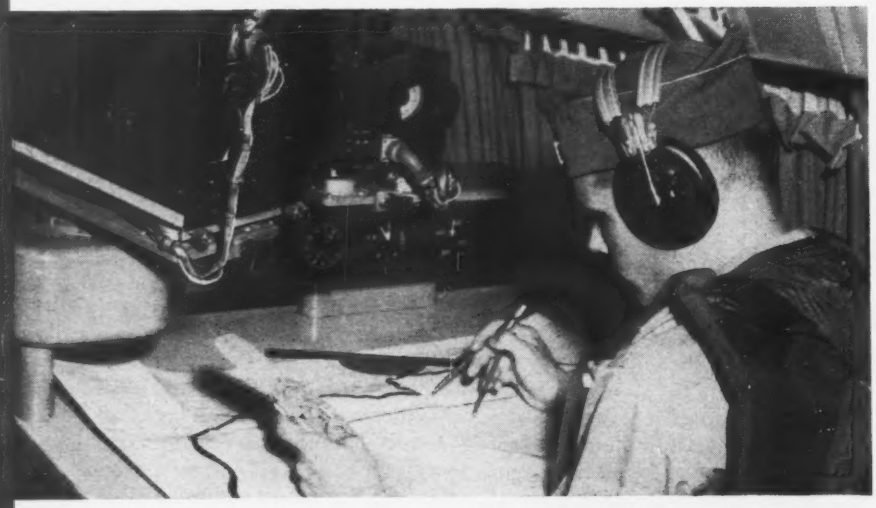
(Continued on following page)



Convair T-29 is used both for training new navigators and updating old ones.

Today's navigators must be just as accurate as ever but a lot faster.

The Convair T-29 was the first plane to be designed specifically for training navigators. Flights average five hours, with about ten students aboard.



Long overwater missions have been renewed as part of navigator training. On these days it may be as much as sixteen hours from briefing to de-briefing.

A recent addition to navigator training is indoctrination in special weapons. Above, the credentials of cadet trainees are carefully checked by the guard.

I could come up with a good three-star fix in fifteen minutes, while my B-24 or C-46 was covering maybe forty miles. That much time in a B-47 or B-52 would take me 150 miles while I was shooting and computing. My information would be so far behind and my lines of position so spread out my work would be easily prone to error, and perhaps useless.

The speed-up has made me obsolete, too, like a B-10 bomber, or a P-40 pursuit, or an A-8 octant. To use the periscopic sextant an observer has to learn to shoot faster and compute faster. Improvements in equipment and tables make it possible for the observer to get a satisfactory position in five minutes or even less.

(In fact, the procedure for one high-speed plane with no room for the crew to move about is said to require the pilot to take the celestial shots and provide the information to the navigator-bombardier to compute and plot the LOPs. There's nothing to it when the plane has a periscopic sextant and the observer has the latest books of tables for pre-computations.)

The sextant automatically averages his shots for him, and he doesn't have to shoot for a full minute as for the A-10 or two minutes as for the A-14 coffee grinder.

In the higher-speed planes you work closely with your flight plan. Students learn to place emphasis on pre-computing altitudes and azimuths. This procedure wasn't too popular with World War II navigators, though Pacific flyers used it some. Now it is heavily stressed.

Work a pre-computed solution for an anticipated time and, when that time comes, shoot a star. Compare your corrected sextant reading with the pre-computed position. Use only the difference between the two to plot on the chart. Three lines-of-position give a quick reading on how close you are to your pre-planned course and position.

Computing line-of-position information is quicker and easier, too. Today's student observer has another post-war improvement—a new book of Hydrographic Office navigation tables called H.O. 249. Its tables eliminate one of the six arithmetical steps that old familiar H.O. 218 required to figure a line-of-position. The tables also provide the star azimuth directly without any arithmetic or geometry in almost every case. That reduces the arithmetic work by sixteen percent or more. Although the book is much larger than good old H.O. 218, it takes only

(Continued on page 143)

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three volumes to cover the globe, as compared to twenty-one volumes of H.O. 218.

The wizards who compiled H.O. 249 selected six of the best stars in the sky to give a good "cut" for each hour angle, latitude, and azimuth. This eliminates much of the time I used to spend in selecting, finding, and identifying a star. However, if I want to use some star other than one of the select six, I've got to figure it out the hard way. But even then one of the six arithmetical steps of H. O. 218 is eliminated.

A recent addition to the navigator training course is indoctrination in special weapons.

To find out what this indoctrination is all about I walked up to the gate of the classroom. A guard was handing out special passes. The class leaving the fenced area was handing in its passes. No one had a notebook.

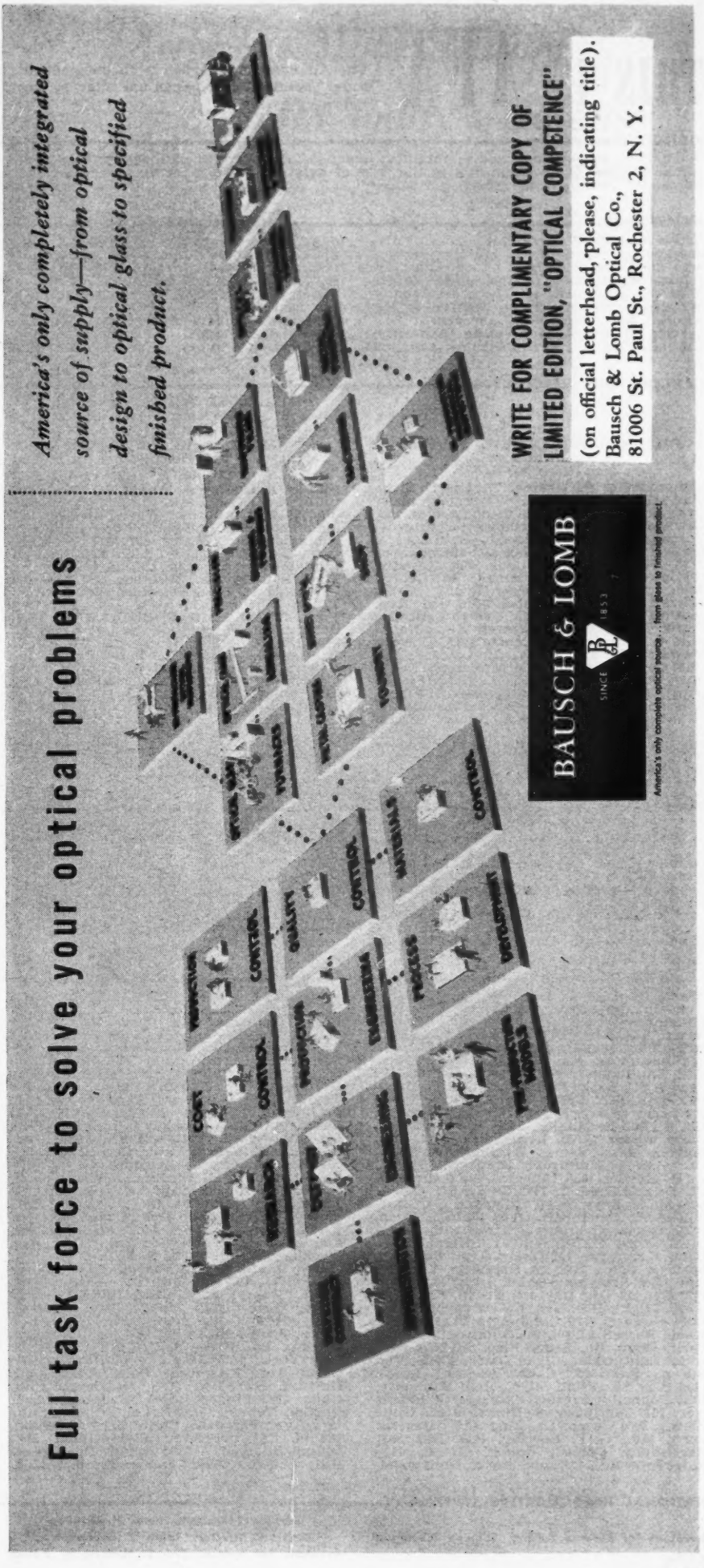
This was real security. I remembered the day the censor had okayed my carrying aerial bomb-strike photographs of half of Europe back with me. I shook my head and walked away. All I know about special weapons indoctrination is that it exists. Period.

Today's navigator gets two more weeks training in being an officer than students got even in 1953 and 1954. On-the-job training for navigation students is also being pioneered at Ellington. Instead of attempting to absorb blackboard diagrams about functions and channels the students move on out to the various administrative and operational sections and ask questions of the non-coms, the men who really know.

Those two additional weeks also include more discussions, lectures and class periods on how to be a good officer and a good leader; more information, more know-how.

For a while, students who graduated Ellington did not receive their wings until they completed an advanced course at Mather Air Force Base, or one of the other advanced schools. But the current practice is the familiar one of issuing wings and navigator ratings at Ellington and other primary-basic schools at the end of the forty-two-week course.

When I saw how navigation students are going through the new type training I got the feeling that now I can relax, shift gears, and think about becoming useful as a chairborne flyer. I can eat till I'm above my fighting weight, too, for some mighty capable tigers are moving along the production line and onto the fighting line.—END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